The Codes Must Be Properly Administered

DESPITE the fact that we have come through the first year's operation under the National Industrial Recovery Act with disappointment, yet let no man despair, for we have before us another year in which to operate, capitalize the opportunities which the act provides and remedy the errors which caused the disappointment.

Let it at once be understood that the disappointment referred to is for the most part centered in the administration of the Act, not in the provisions and principle of the Act itself—for the Act provides for the introduction of a new method of restricted competition which it is believed can be worked out as a basic principle for better business stability and practice, and is the only method presented which gives industry, labor and commerce the opportunity to whip the depression.

The Industrial Recovery Act was passed June 16, 1933, and Congress limited its operations to June 16, 1935. Immediately upon its passage, industry generally went to work compiling codes. The paper industry was among the first to pledge the President its immediate and hearty co-operation.

The compilation of the codes was a long tedious job. The Paper Industry Code was not completed and approved until last November. The intervening time was well spent. It was an educational and constructive period for the entire industry. It represented weeks and months of laborious work compiling facts and statistics upon which to base code recommendations.

Every factor, major and minor, in the entire twenty-four divisions in the paper industry took more or less active part in contributing to the framing of the code. Representatives of the industry, from every section of the country, met together about the common table, put facts, figures and trade practices before each other, reviewed them in the light of what was best for the whole industry, and finally by a most impressive and overwhelming majority, reflecting an unprecedented unanimity of opinion certified up to the administration a code, under which they, as an industry believed they could work out the economic security of all concerned.

That was an accomplishment of majestic proportions. It represented an investment of time, brains and effort that must not be allowed to fail.

Like every other act passed by Congress, the success or failure of the plan depends largely upon its administration. Of course, if the Act is rightfully conceived and framed to secure certain beneficent results, as the Recovery Act is, the chances of its working depend also upon the enthusiasm or lack of interest manifested by the factors whom it was designed to affect. In this case, probably no other act of Congress for a generation, received such wholehearted, universal support from all concerned.

Therefore, all that we labored for and accomplished in the past fiscal year of the Act must not be allowed to fail because the administration of its provisions was faulty.

We know where the weakness lies—politics crept into the administration machinery. Politics must be kept out of the Recovery Act administration.

For fifteen months industry planned and legislated for its economic recovery and betterment. The opportunity for that legislation was conferred upon industry. The results of that industrial legislation

spell the ultimate economic recovery of the nation.

We believe it is the desire of the administration to rightly administer the codes, but under our form of government, when congressional influence is allowed to cut in and balk the administration, all the labor of the past year is in danger of being nullified.

This must not be allowed.

Industries must rally to the defense of their codes. They must be rescued from the thraldom of political atrophy. We believe the coming days will witness a determined demand from every division of industry and from the great majority of the voters in these industries, irrespective of political affiliations, that the codes be righteously administered.

The Closed Purse

DURING the past several years many executives who had formerly given little if any thought to equipment purchases, made a right-about-face. They diminished the authority of those who had formerly had some freedom in making purchases and took charge of the actual purchasing themselves. No order, seemingly no matter how small, was placed for equipment or maintenance material without their official sanction. The money bag had been closed to conserve resources and they held the purse strings.

Without doubt this action on their part was essential to the well-being of their individual organizations; and after months of direct control of purchases they could probably point to figures that would indicate real savings that were being made. At the same time they could refer perhaps to some actually extravagant purchases of the past and reflect on how the present method of buying would have made such purchases impossible. Nevertheless, it might be pointed out that all men are subject to error, and they might have made similar or even greater blunders if the decision relative to the same purchases had rested entirely with them.

Progress, however, comes through change and it is just as essential for these men to consider the purchase of new equipment and the modernization of old as it is for them to merchandise what they themselves produce. The purchase of a new piece of equipment might actually decrease the cost of production or improve the quality of the finished product. In fact, equipment that has been in operation over a period of years may be of obsolete design or beyond the point where it can be economically repaired. It might actually be more expensive to keep the old equipment in operation than it would be to purchase something that is new and possibly of more efficient design. It is all right to hold the purse strings, but one should not be deceived by false economies.

Learn what you can of new developments of the past few years. Study these developments in relation to your own plant. Ascertain whether there is actual merit in the claims made for any item of equipment that proves itself interesting and if the claims are logical, profit by making the purchase rather than keeping the purse closed.

The Superintendents Association

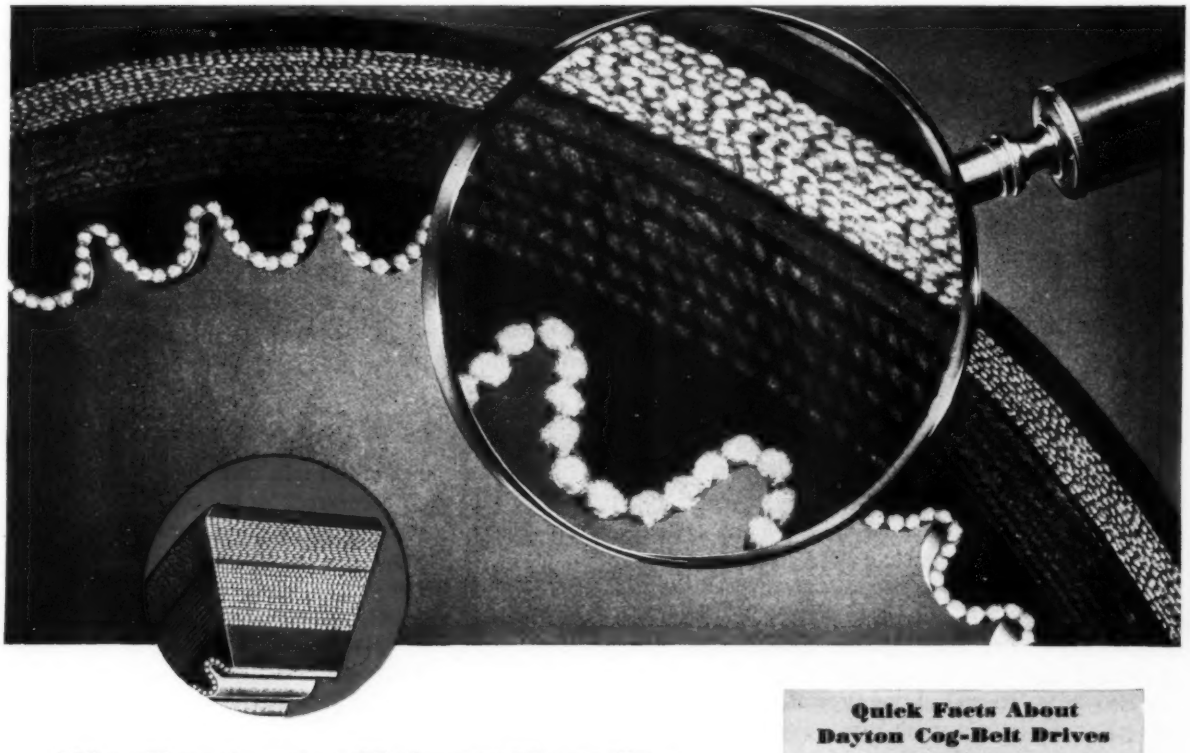
IT IS understood that the primary purpose behind the actual formation of the American Pulp and Paper Mill Superintendents Association was to weld into one body the leading production executives of the industry for the purpose of discussing mutual problems and to improve themselves as individuals in the knowledge of the industry from which they were making their livelihood. Surely such a purpose was a most worthy one, and it had no precedent so far as is known within the annals of pulp and paper making.

The inception of the idea came at a time when many of the production executives had a closed mind as to the possibilities of such an organization. The knowledge of the individual in their opinion was the individual's stock in trade, and because of it there would be no opportunity for making a success of such an undertaking. No doubt, the idea had smouldered previously in the minds of a number of the more progressive, but it had never blazed into an actuality. It took vision, courage, and strength to fan such a smouldering idea as there might have been into a blaze of even a rudimentary organization.

The recent meeting of the Association on June 20, 21 and 22, 1934, at Poland Spring, Me., the fifteenth annual convention of the organization, however, revealed most impressively the strength and workability of the original idea. Not only was this meeting well attended, probably the largest attendance in the history of the Association, but the entire program was one of real inspiration and helpfulness.

It is appreciated that traveling hasn't always been smooth for those who in the past guided the destiny of the organization to its present position. Those leaders might be likened aptly to our early pioneers who blazed the trail as they plunged forward into the wilderness to make it easier for others who would follow. Out of this pioneer effort, however, has come an organization that should be a credit to the industry of which it is a part and a satisfaction to those who have had any part in building it.

Greater Gripping Power
with less tension



Sides *die-cut*—not molded—provide another exclusive and important reason for the proved efficiency of Dayton Cog-Belts

A powerful, leech-like grip—less slipping or sliding even with quick starts and stops—less loss of power—less vibration—

—these are some of the many advantages assured by the *die-cut sides* of Dayton Cog-Belts. The raw edges of the die-cut sides contact the sides of the pulley groove and form the driving surface. There's practically no wear. Nor will they ravel. Nor glaze.

Because of this exclusive construction no other V-Belt provides such unfailing gripping qualities—such a steady, uniform flow of power, regardless of speeds—all with less tension, less wear on the bearings.

And in addition to die-cut sides, Dayton Cog-Belts have many other outstanding features. They're the only belts *built to bend*. Because of their cogged inner surface and laminated construction they have far greater flexibility. Even on the smallest pulleys there's no buckling, no distortion, no "squashing" in the pulley groove—*the only V-Belt that combines maximum flexibility with crosswise rigidity.*

And economical, too—cost less to use. They're pre-stretched, so adjustments are seldom necessary. And their *life* is *twice as long* as ordinary belts.

These are only a few of the reasons for the pronounced trend to Dayton Cog-Belt Drives in the power transmission field. We shall be glad to send you all the facts.

THE DAYTON RUBBER MFG. CO.
DAYTON, OHIO

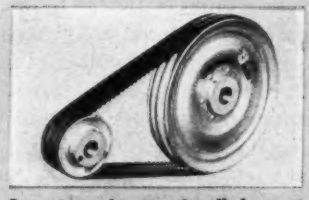
Factory Distributors in Principal Cities and all Westinghouse Electric and Manufacturing Company Sales Offices

Quick Facts About Dayton Cog-Belt Drives

1. Save floor space.
2. *Built-to-bend*—no distortion—no internal heating.
3. Greater gripping power—no slipping or sliding.
4. Stretch removed—fewer adjustments necessary.
5. No dressing or lubrication.
6. Less tension required—easy on bearings.
7. Longer life—belt replacement costs often cut in half.
8. Quiet—Clean—Rugged.

Complete drives—pulleys and belts—in stock. Fractional to 100 H. P.

DAY-STEEL PULLEYS



Investigate the exceptionally low cost of Dayton Cog-Belts with Day-Steel Pulleys

Built to Bend

Dayton
COG-BELT DRIVES

Also manufacturers of Dayton Fan Belts . . . Dayton Red Tube Radiator Hose . . . and the famous Dayton Thorobred Tires and Tubes

Next Winter

By WILLIAM SIBLEY

PUBLIC relief, as administered throughout the nation during 1929—five years ago—is startling in retrospect. Startling at least in the sense that it fully revealed the universal failure to recognize the seriousness of the situation or to vision the probable duration of the necessity for relief. Startling also in the contrast between the steps then taken and those now found necessary.

Relief work during the past five years has altered itself in at least two major ways: First, it has increased prodigiously in amount. From the one-thirtieth of the population then in want, this next year will find one out of every six in need of aid. Second, relief work has become less and less a private function and more and more a public function. Five years ago the greater percentage of the relief burden was borne by a relatively few endowed private organizations and charitably minded individuals. This year at least ninety cents, and probably more, of every relief dollar will come out of the public purse. And this means, to the thoughtful minded, that the difficulty of raising relief funds has increased proportionately.

All of which is spoken of here, and at this time, only because I believe every plant manager and every municipal government (and many paper mill men are also "city fathers" of one type or another) should recognize the certain truth that we are in for another bad winter. Several well-informed people have told me: " . . . . . the worst yet." This is not pessimism. I am not suffering from depressionitis, nor am I a student of kill-joy-of-summer journalism. It is just a matter of facing the facts. We have to do it sometime. Let's do it now. Let's recognize the need for preparedness while there is yet time to fully prepare. With the utterly changed character of relief work, plant managers and their local city governments cannot start preparatory work too soon.

Just to indicate simultaneously the growth of the relief demands and the changed sources of revenue, let me show you the figures for the relief burden of New York City. In the first of the following columns is named the monies expended by the City Relief Funds (private organizations, individuals, and city governments). In the second column is shown the amounts paid out by state and federal funds. (The 1934 figures are estimated from the known expenditures of the first four months of this year.)

	Local City Funds	State and Federal Funds
1931	$14,701,476.00	$ 51,293.00
1932	24,994,295.00	14,791,969.00
1933	35,698,200.00	52,384,226.00
1934	35,000,000.00	175,000,000.00

While New York City is the one place in the United States where enormity may be found, it should be remembered that these figures apply to the city alone. And while New York City may have a corner on spectacular bigness it has no corner on need, destitution or despair. There are hundreds, if not thousands, of communities which will face acute relief problems next winter. . . . Problems as big for those several communities as New York City's problem is to New York City.

If you wait until "the frost is on the pun'kin" to name relief committees and get at the tremendous job before every community, you will not meet the situation so completely or adequately as you would if you start now and see to it that by the time "the fodder's in the shock," all preparatory work has been done.

Not only should local mill men make certain their local civic bodies get started for the coming work now, but if every paper mill man could provide adequate care for all needy former-employees they would do a job second to no other industry. And by the same token, if the paper mill men would go further and get other local industrial plant managements to care for *their* former employee relief burden, the unfortunate families themselves would doubtless receive better care, and the public purse would be given relief to expend its efforts in directions beyond such control methods.

So far as possible, get your local governments and yourselves to giving relief *work* instead of straight home relief. Nothing so undermines a needy man's morale and self-esteem as idleness and forced acceptance of charity. And relief is the charity of former years. However trivial or uneconomic the work may be, relief *work* makes it possible for a man to convince himself that he is working out his own relief and is therefore a useful citizen.

Where paper mills can, they should adequately care for the needy among their former employees. There are the places where improved parking spaces, better plant lighting, repainted buildings, remodeled warehouses, new driveways, yard beautification, and a hundred other things can be planned now—and finished next winter. Local city governments should plan now for the planting of trees, elimination of grade crossings, refreshening of buildings, establishment of play and picnic grounds, and many other similar projects.

Next winter will soon be here. For many people it will be a hard winter. Let's do the American thing —give those people relief work—not charity.

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THE PAPER INDUSTRY

A MONTHLY EDUCATIONAL JOURNAL

Papermaking Chemical Raw Materials

ALTHOUGH chemicals in some form have been employed in the production of paper from the very early days of its manufacture, it has only been within comparatively recent years that the number of chemical raw materials required and the quantity consumed by the industry reached proportions of real magnitude.

It is highly probable that Tsai Lun, the Chinese scholar who is credited with the invention of paper, utilized some chemical raw material in its production. Perhaps lye produced from wood ashes was employed. At least this material has been suggested as possibly being used by the early Arabian papermakers in the treatment of linen rags.

Other chemical raw materials came into use for papermaking as its processes were improved. Their actual application, however, was often veiled with the secrecy of the alchemist. The individual mill had its formula for producing a certain grade of paper, and this formula was both adhered to explicitly and guarded jealously.

Then came the development of the wood pulp processes, and with them the need for additional raw materials. These materials were not only required for the pulping operations, but also for the production of papers that had been unknown previous to the utilization of wood pulp for paper.

The expansion of the industry and the demand for uniform quality of product developed the need for more accurate control of plant processes. This control in turn made it necessary to obtain more definite knowledge of the fundamental characteristics of each of the raw materials employed as these characteristics indicate within certain limits at least how an individual material can best be handled and what results might be expected from its use. Certainly, some of the chemical raw materials utilized by the pulp and papermaking industry are as essential to the actual functioning of the industry as are the fibrous raw materials from which the paper is made.

Among the materials that might be considered in this manner are paper makers alum, casein, chlorine-gas and liquid, clay, limestone and lime, rosin and rosin size, salt cake, silicate of soda, soda ash and caustic soda, sodium chloride, corn starch, sulphur, titanium pigments, and zinc sulphide pigments. It is most assuredly a rather formidable list, but each one of the materials mentioned fills a definite need within the industry.

Many of these materials are so important that standard methods of analysis have been developed for them. Yet, so far as is known, no convenient reference has been developed to furnish technologists and operating executives with fundamental facts pertaining to the physical and chemical characteristics of these materials.

It is true that such information may be found in various technical handbooks or reference works, but such publications may not be immediately available to the searcher for information. Therefore, THE PAPER INDUSTRY, believing that such a compilation will prove helpful to the trade, presents herein a symposium covering many of the most important characteristics of these important materials.

PAPER MAKERS ALUM

By JOHN F. FREDRIKSSON, Production Manager
American Cyanamid & Chemical Corp.

PAPER makers alum is a partially dehydrated aluminum sulphate. The true aluminum sulphate has the chemical formula $Al_2(SO_4)_3\ 18\ H_2O$ and contains 15.30 per cent Al_2O_3 whereas the so-called paper makers alum contains 17 per cent Al_2O_3. A better description of paper makers alum is that it is true aluminum sulphate with four molecules of water removed.

This article comes on the market in two distinct and different grades—commercial and iron free. Practically the only way these two grades differ lies in the iron content, the so-called iron free containing about 0.005 per cent and the commercial 0.5 of iron oxide.

Aluminum sulphate occurs in nature in considerable quantities as such or as a constituent of a number of varied minerals, such as alunogen, halotrichite and feather alum, which minerals are found in various volcanic districts. It is also found in nature in combination with potassium sulphate as alumite, a mineral found in various parts of the globe, one large deposit occurring in Utah.

Either due to distance from markets or difficulties of extraction, none of these natural occurrences have been exploited to any important extent. It may safely be said that practically all sulphate of alumina used today is a manufactured article. Of the raw materials available for its manufacture, the two most important are certain kinds of clay and bauxite. In this country, practically all sulphate of alumina is made direct from bauxite—an impure aluminum hydrate—and the iron free from aluminum hydrate which is produced from bauxite by purification, using the so-called Bayer process, which eliminates silica and iron, the two main impurities found in bauxite.

Bauxite is found principally in Georgia and Arkansas in this country, and the Guianas in South America. Large deposits also exist in Europe and Asia.

The paper maker insists upon a commercial sulphate containing not more than 0.5 per cent iron oxide which specification makes it necessary for the producer to use as a raw material a bauxite very low in iron and notwithstanding the fact that there are large bauxite deposits available, the particular grade needed for the production of commercial sulphate of alumina is already scarce and becoming more so every day.

Bauxite is mined in various ways, both strip and tunnel mining, depending on character of deposit. It is then often concentrated by washing before being crushed and dried for shipment to the aluminum sulphate producer.

For the production of sulphate of alumina, the bauxite is ground to the necessary fineness and conveyed to large digesters containing sulphuric acid and boiled vigorously for several hours until the reaction between the alumina and the sulphuric acid is completed forming aluminum sulphate. This impure aluminum sulphate solution then is settled and decanted or filtered to remove silica and other insoluble material.

The clarified aluminum sulphate solution is concentrated by evaporation to the desired Baumé which in the case of 17 per cent material is approximately 61.5 degrees. This hot concentrated syrupy solution is poured onto pans where it solidifies upon cooling. The solid material is a brittle cake of varying color, usually light brown or light green, depending upon raw materials and processing.

The iron free sulphate is produced in very much the same manner as the commercial with the exception that aluminum hydrate is usually used as raw material instead of bauxite, also more care must be taken as regards to the iron content of the sulphuric acid used. Physical characteristics of the iron free are also the same except that the color of the iron free is pure white.

The finished product is either sold as slab, lump, ground or powdered. Slab, sometimes even lump and ground are shipped in bulk in paper lined cars. Most of the material, however, is shipped in burlap bags, lined or unlined, containing 200 lb. each. Barrels containing 300 to 400 lb. each sulphate of alumina, depending on grinding, and multiwall paper bags containing 100 lb. each are also used.

Ground aluminum sulphate weighs from 72 - 76 lb. per cubic foot; lump aluminum sulphate approximately 64 lb.; and solid cake about 108 lb.

Aluminum sulphate is somewhat hygroscopic and absorbs water upon standing for any length of time. It is easily soluble in water, the solubility increasing with the temperature. The solution is quite corrosive wherefore special materials should be selected for its handling and storing.

Aluminum sulphate is of great importance to industry. It is used in the purification of water, in the tanning industry, in the production of fireproofing materials, etc. Its greatest importance, however, is in the paper industry, where it is used for clarification of process water, for the setting of certain types of dyes, for the prevention of foam, etc., and last, but not least, the paper mills use it in combination with rosin size for the sizing of paper.

For the correct sizing of paper, the correct amount of aluminum sulphate is of prime importance and it is a fact that paper makers in the last few years have made great strides as regards to obtaining and maintaining the proper aluminum ratio so necessary for optimum sizing conditions. In this they have been greatly aided by the perfection in late years of an easy method of hydrogen ion determination, which allows control to closer limits than were ever before possible. Another factor responsible to a large extent for present day sizing efficiencies is, no doubt, the technical services rendered on the use of size and alum by chemical organizations manufacturing these articles.

Many substitutes for sulphate of alumina have been tried, both for water purification and in the paper mill, but so far, none has been found to completely replace it and it is safe to assume that for years to come aluminum sulphate or, as it is called, paper makers alum, will continue to occupy a place of greatest importance, both to waterworks and the paper mill.

CASEIN

By EDWIN SUTERMEISTER, Chief Chemist
S. D. Warren Company

CASEIN is an organic compound which, in its pure form, contains the elements oxygen, carbon, hydrogen, nitrogen, sulphur and phosphorus. These elements are present in such nearly constant proportions in the pure caseins from the milk of different animals that elementary analysis cannot be used to distinguish them. Commercial caseins also contain small amounts of other elements, derived from the precipitating agents or from the milk itself, the chief of which is the ash forming constituent calcium. Chemically, casein belongs to the group of compounds known as phosphoproteins, which are undoubtedly among the most complex organic substances with which the chemist has to deal.

The following table shows representative analyses of casein:

Elementary Analysis of Pure Casein

Carbon	52.96 per cent
Hydrogen	7.05 per cent
Nitrogen	15.65 per cent
Sulphur	0.72 per cent
Phosphorus	0.85 per cent

Proximate Analysis of Commercial Casein

Moisture	6.57 to 9.44 per cent
Fat	0.12 to 1.41 per cent
Ash	1.62 to 7.97 per cent
Nitrogen	14.20 to 15.12 per cent

When freshly precipitated, casein has the whiteness and consistency of cottage cheese, but when dried out it becomes yellowish white to light yellow in color. The commercial product varies according to the degree of grinding from about 20 mesh to that which will nearly all pass a 100 mesh screen. The coarser products are satisfactory for use in paper coating, where sufficient time can be allowed for dissolving, while the finer grades are demanded for paints and other uses where solution must be very rapid. Good grades of casein should have very little odor, either in the dry state or after dissolving, but it sometimes picks up strange odors from materials stored near it.

Even the most pure casein is considered to be a mixture of at least two proteins of very similar characteristics, but in spite of this its molecular weight is frequently mentioned. The minimum figure is given as 12,800 but it is undoubtedly much greater, and estimates place it as high as 192,000. Proteins may be considered as complexes of amino acids condensed together by elimination of water molecules, and by appropriate methods these acids may be separated and identified. The complexity of the problem of the formula of casein is seen from the fact that it has already yielded over twenty such acids.

Casein is amphoteric in nature, uniting with either acids or bases to form compounds which are more or less soluble in water, with the formation of colloidal solutions. The minimum solubility of casein occurs at a pH of 4.6, where approximately 0.11 gram per liter dissolves at 25 deg. C. Solutions produced by means of acids are of relatively little importance commercially, but its solubility in alkaline solutions enables it to be used in paper coating, paints, glues, leather, textiles, etc. Solution in acid is preceded by swelling to a certain limit but that in alkalis is analogous to the dissolving of sodium oleate.

The alkalis with which casein is combined to bring it into a soluble condition are often incorrectly spoken of as solvents, at least in the paper coating industry. Those used for this purpose are ammonia and the alkaline sodium compounds, such as caustic soda, soda ash, borax, sodium phosphate, etc. Soda ash may be used because casein is a stronger acid than carbonic and will liberate carbon dioxide from solutions of the carbonates or bicarbonates. The potassium compounds could also be used except for the greater expense. In the production of glues of a water resistant nature and in the cold water paint industry the chief alkali used is calcium hydroxide. This forms calcium caseinate, which is an irreversible jelly and which, when once dried out, cannot be again dissolved in water. Sodium, potassium or ammonium caseinates form reversible jellies and hence do not give waterproof glues unless treated in some way to render them irreversible. This can be accomplished by addition of hexamethylenetetramine or formaldehyde, but the reaction is difficult to control and they find little use for this purpose in glue and paint making. Formaldehyde is, however, very largely used in the plastics industry to harden casein and render it insoluble.

Casein forms well defined disodium compounds and from these the alkaline earth or heavy metal compounds may be formed by treatment with solutions of the corresponding salts. Some of these, notably the calcium, silver, mercury, iron and bismuth salts find a limited use in medicine. Casein also forms addition products with the halogens, compounds with tannic acid, nitrocasein by treatment with concentrated nitric acid and methylated casein by adding methyl iodide to a solution of alkali casein in absolute alcohol. Many other compounds have been produced experimentally but are at present of academic interest only.

Casein is subject to decomposition by molds and bacteria, but little is on record regarding the chemical changes taking place under such conditions. It is known that molds cause the casein to be less valuable for paper coating because of the formation of white masses of mold hyphae. Bacterial action ultimately results in a complete break down of the casein molecule with the production of very evil odors and the total loss of the valuable properties of the material.

Of the common tests for casein, the xanthoproteic reaction with strong nitric acid depends on the presence of aromatic nuclei in the protein molecule. The biuret reaction depends on the formation of a violet color when the solution is rendered alkaline with caustic soda and then a dilute copper sulphate solution slowly added. Both tests are for the general class of proteins and are not specific for casein.

CHLORINE—GAS AND LIQUID

By A. H. HOOKER, Technical Director
Hooker Electrochemical Company

ELEMENTAL chlorine (Cl) discovered in 1774 by Scheele, an eminent Swedish chemist and apothecary, and named by Davy in 1810, is not found in nature, but is derived commercially from common salt and in some instances from potassium chloride. At ordinary temperatures, it is a pungent, yellowish-green, non-inflammable gas which may be liquefied by compression or refrigeration or a combination of both.

Among the numerous technical characteristics of chlorine are the following:

Physical Constants

Atomic weight	35.46
Molecular weight	70.92
Freezing point	—101.5°C
Boiling point (760 mm. pressure)	—33.6°C

(At 760 mm. and O°C)

Chlorine gas density	2.49 (air—1)
Liquid chlorine specific gravity	1.47 (water—1)

1 volume liquid chlorine yields 460 volumes chlorine gas
1 pound liquid chlorine yields 5 cubic feet chlorine gas
1 cubic foot of liquid chlorine weighs 92 pounds

Chlorine Solubility in Water

Temperature	Grams per Liter	Pounds per 1000 Gallons
10°C	9.5	79.2
20°C	6.9	57.5
40°C	4.5	37.5

Combining Proportions in Preparation of Hypochlorite Solutions

1 lb. chlorine combines with:
0.79 lb. lime (CaO)
1.04 lb. hydrated lime [$Ca(OH)_2$]
1.13 lb. caustic soda (NaOH)
3.00 lb. soda ash (Na_2CO_3)

1 liter lime bleach solution dissolves:
1.8 grams $Ca(OH)_2$ or
1.4 grams CaO

100 gals. lime bleach solution dissolves:
1.5 lb. Ca(OH) or
1.17 lb. CaO

Latent Heat of Evaporation

B.T.U.	Temperature (F.)	Pressure (lb. gauge)
125	—28.5 deg.	liquid at 0. pounds
115	32.	38
111	60.	71
106	86.	113

All of the chlorine produced in the United States is separated electrolytically from the raw materials from which it is derived. About four-fifths of the installations for this purpose utilize asbestos diaphragm cells with graphite anodes. To these cells, which differ greatly in design and efficiency is delivered a strong solution of brine. The brine in the case of an individual cell is fed to a compartment with graphite anodes separated by an asbestos shield against a perforated iron cathode with a receiving compartment. When a direct current is used that is sufficient to overcome both decomposition voltage (2.3 volts) plus an electrical resistance of 1-2 volts, the brine is broken down.

Chlorine gas is given off at the graphite anode and usually drawn off continuously saturated with moisture to a pipe line for further treatment. Metallic sodium is momentarily deposited on the cathode plate at the opposite side of the asbestos diaphragm. Here the metallic sodium comes into immediate contact with water which it decomposes into hydrogen gas plus caustic alkali. The hydrogen gas was formerly allowed to escape but now it is usually collected and, while only 1/35.5 part of the weight, is equal in volume to the chlorine. The liquid from the cathode compartment consists of caustic alkali together with a material amount of undecomposed brine. The moist hydrogen gas and caustic solution are separately collected for further treatment.

After chlorine gas saturated with moisture is obtained from the electrolysis of chloride, usually common salt or brine solutions, it is cooled and thoroughly dried in earthenware equipment. Sulphuric acid is commonly used for the final drying. The dry gas can be handled in steel or iron equipment and as a result of pressure and cold, the heavy greenish-yellow gas is converted to a heavy orange colored, clear liquid, which is stored in insulated tanks until used or packed for shipment.

Liquid chlorine as such is shipped by the manufacturer to the consumer in steel cylinders of 100 and 150 lb. net weight and in three types of tank cars, 30 tons and 16 tons net weight and multiple unit tank cars with 15 containers each holding one ton each.

Up to a period after the World War, bleaching powder, a product containing some 35 to 38 per cent of chlorine absorbed by moist hydrated lime, was almost exclusively used as a source of chlorine or bleach liquor in the pulp and paper industry. The past twelve years, however, have seen a rapid and almost complete switch to the use of liquid chlorine and hydrated lime within the paper mill itself to make an identical bleach liquor with one-third the sludge to be washed or disposed of and has made possible the production of stronger bleach solutions where desired and, what is even more important, makes possible two-stage bleaching whereby chlorine gas as such acts directly on the fiber and the dissolved colored liquor largely removed, and then a treatment with bleach liquor finishes a stronger and finer product with less chlorine consumed.

Very large quantities of chlorine are also used for the sterilization of water supplies, slime control, and for the treatment of sewage and industrial wastes. It is likewise used for the bleaching of textiles and shellac and in the production of many inorganic and organic chemicals.

CHINA CLAY

CHINA clay is the weathered or decomposition product of feldspathic rocks and is one of the world's most widely distributed minerals. Deposits of good grades of clay are found in several European countries as well as in the United States and Canada.

The mineral as mined for use in papermaking is commonly washed with water, riffled, screened, concentrated by settling or filtering and then dried. Such treatment removes the heavier impurities of which quartz, mica, and feldspar are the most important from the papermaking standpoint.

The resultant product is a soft, whitish, impalpable powder which when kneaded with water forms lumps of smooth, even texture. These lumps may be very easily crumpled or cut smoothly with a knife. The mineral also has a smooth, greasy feel and examination under the microscope reveals that its individual particles are irregularly shaped and vary widely in size. In fact, the proportion of fine and coarse particles of clays of very similar appearance may be quite different.

Chemically, china clay is a hydrated silicate of alumina, which is represented by the formula $Al_2O_3 . 2SiO_2 . 2H_2O$, and a composition that approximates 39.5 per cent Al_2O_3, 46.6 per cent SiO_2, and 13.9 per cent H_2O. Its important physical properties, in so far as its use in papermaking is concerned, are freedom from grit, fineness, color, specific gravity and retention.

Naturally, the more grit present the poorer is the clay, either as a filler or as a coating. A good clay, if subjected to a sieve test, should leave less than 1 per cent residue on a 325-mesh screen. Clay containing grit, when used as a filler, cuts the paper machine wires, felts, and jackets; scratches calender roll surfaces; causes holes to appear in the finished paper; and dulls unnecessarily the paper cutter knives. A similar clay when used for coating is equally detrimental. In fact, trouble might not be confined to the paper mill if a clay with an excessive amount of grit is used. It might even be carried along to the printer.

Fineness of the clay particles affects the finish of the paper put on by calendering. A higher gloss will be imparted to the sheet with the finer particles. The finer clay on the other hand requires a larger amount of casein or other adhesive when used for coating.

The whitest and best grades of clay are always preferred, particularly for coating purposes. Color may be of lesser importance in the production of the poorer grades of paper, but it must always be considered.

Should it be desirable to compare the colors of two clays, the samples should first be dried at 105 deg. C. Then an equally small amount of each should be placed side by side on a sheet of black paper and pressed down with a polished stainless steel spatula to make a smooth surface. Any difference in color can at that time be easily seen.

Sometimes color is added to an inferior grade of clay to improve its appearance. A blue dye such as ultramarine, for example, may be used to correct a yellowish color due to the presence of an excess of iron. The presence of ultramarine in such a clay may be detected under a microscope but sufficient care must be exercised in making the examination to not confuse bluish particles that are sometimes found naturally in china clay with it. It might also be detected through the use of a freshly prepared saturated solution of lime water. The lime water will remove the blueing and such a clay in the lime water will show quite a different color from a clay which does not contain artificial coloring. A coal tar dye used in place of ultramarine is not so easily detected. Stevens[1] suggests that it is best to shake out the clay with alcohol in which dyes are usually soluble.

Specific gravity as a quality to be considered in judging a clay is of importance as it indicates how the material will affect the bulk of the paper. Published references indicate figures for its specific gravity ranging from 2 to 2.86. The average figure probably approximates 2.4.

Retention refers to the quantity of clay, retained by the fiber in a finished sheet of paper. In book paper, the kind of paper in which the greatest quantity of clay is used, the clay may ordinarily constitute from 10 to 20 per cent of the weight of the sheet. In some instances it may run as high as 40 per cent. Clay in lesser amounts is sometimes used in cheap writings, tablets, newsprint and hangings. Retention of course varies with the per cent of filler in the furnish, machine speed, weight of sheet, consistency of stock, and strength of suction on the machine. It is, therefore, logical that it increases with increase in particle size, with increase in sheet thickness, and with increase in stock slowness, as well as with a decrease in specific gravity and a decrease in machine speed.

In using clay as a loading or filling material it is usually added to the stock in the beater shortly after the beater is furnished. This procedure permits the clay to be uniformly distributed throughout the stock mass prior to the addition of alum. Formerly it was common practice to add the dry clay direct to the stock, but it is now considered better practice to mix the clay with water in the proportion of one to two and one-half pounds of clay per gallon and then to screen the suspension to remove dirt. Sometimes small amounts of sodium silicate, ammonia or sodium phosphate are added with the water at the time of mixing to help keep the clay in suspension and to make screening easier.

Clay is usually shipped in bulk, each car being covered with kraft paper to keep out the dirt accumulated in transit. It is also shipped in burlap, cotton, and kraft paper bags for added convenience in handling. The weight per cubic foot, depending somewhat on the method of handling, varies from 53 pounds to 84 pounds for a clay containing about 7.5 per cent of moisture.

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[1]The Paper Mill Chemist.

LIMESTONE AND LIME

By O. L. COOK
Lehigh Lime Company

LIMESTONE is a natural rock composed principally of calcium carbonate and magnesium carbonate and containing such impurities as alumina, silica, and the sulphides of sulphur, iron, and phosphorus. It is reasonable to assume the calcium found in so much of the earth's crust came from igneous rock, the lime being taken into solution as bicarbonate through the action of carbonic acid, and reprecipitated as the carbonate, through the intermediary of vegetable or animal organisms, either directly or indirectly. The composition of limestone varies from pure calcium carbonate ($CaCO_3$) to pure dolomite ($CaCO_3$-$MgCO_3$). Although true dolomite is the double carbonate of calcium and magnesium, it is the custom to call any stone running high in magnesium dolomitic limestone.

Quick lime, sometimes termed bulk lime, is produced by subjecting limestone to a sufficient temperature to drive off the carbon dioxide (CO_2), forming the oxide of calcium and magnesium. Approximately two tons of pure calcium limestone are required to produce one ton of quick lime.

Hydrated lime is produced by the chemical combination of water with quick lime forming $Ca(OH)_2$, calcium hydroxide.

The extremely variable nature and composition of limestone, and consequent impossibility of uniform operating practice, makes it advisable that lime for chemical purposes be secured from a reliable manufacturer employing thoroughly scientific methods. It has become an accepted fact that physical characteristics are more important than chemical analysis in selecting a lime for industrial purposes, and a comprehensive study of available stone is as essential as chemical control of the manufacturing process. Many times two limes almost identical in chemical analysis will perform very differently. The physical characteristics of the finished lime may also be controlled within limits, as for example the profound effect of the cooling rate after the lime has been drawn from the kiln.

Quick lime for both the Soda and Sulphate processes should be as high as possible in available calcium oxide, and correspondingly low in impurities. Available calcium should not be confused with total calcium, as in some cases a lime testing higher in total calcium oxide content will actually contain less available oxide. This is due to physical characteristics and to some of the calcium being combined with the impurities. It is also essential that the lime settle out rapidly. This quality can best be determined by trial, as the physical make up of the stone from which the lime is made and local conditions at the mill are important factors.

For water treating purposes, any good quick or hydrated lime of the high calcium type can be used, hydrated lime being preferred in most cases, because it can be handled and stored more economically. The American Water Works Association recommend that hydrated lime should have at least 90 per cent available calcium hydroxide $Ca(OH)_2$; and quick lime at least 85 per cent available CaO, for this purpose.

For cooking rag stock, either quick lime or hydrated lime may be used, the hydrated lime being more easily handled and stored. The lime is used to dissolve dirt and impurities, to saponify greases, and to destroy any wool that may have passed by in the sorting. The low solubility of lime insures against too vigorous a treatment of the fibre and results in a higher yield. About 400 pounds are required for 5000 pounds of rags.

In the cooking of straw both high calcium and high magnesium lime is used, advantages being claimed for each type.

Satin White requires an extremely pure, white, high calcium hydrated lime, practically free from both iron and silica.

Considering the combining weight of forty for the element calcium, twelve for carbon, and sixteen for oxygen, one hundred pounds of $CaCO_3$, or pure limestone, will contain forty pounds of calcium, twelve pounds of carbon, and forty-eight pounds of oxygen. When this one hundred pounds of limestone is burned in the kiln, forty-four pounds of carbon dioxide (CO_2) are dissociated as a gas, leaving fifty-six pounds of calcium oxide (CaCO) or quick lime. This fifty-six pounds of oxide of lime will combine with eighteen pounds of water, forming seventy-four pounds of hydrated lime, $Ca(OH)_2$.

Quick lime, CaO, has the following properties: Specific gravity 3.2, melting point 2550 deg. C., boiling point 2850 deg. C., specific heat 0.18, refractive index 1.8, hardness (fused oxide) 3-4, molecular weight 56.07, weight in pounds of one cubic foot as usually stored 50 to 70, cubic feet per ton 45 to 32.

The properties of hydrated lime, $Ca(OH)_2$, which is a fine dry powder, over 98 per cent passing a two hundred mesh screen, are as follows: Specific gravity 2.3, Specific heat 0.20 (?), Solubility in water at 100 degrees g/l 0.60, Heat of solution 2800, Hardness 2-3, Molecular weight 74.09, Weight in pounds of one cubic foot as usually stored 30-50, cubic feet per ton 75.45.

Hydrated lime is packed in 50-pound paper bags and can be stored for a reasonable length of time without appreciable deterioration. There will be a slight recarbonation due to absorption of carbon dioxide from the air through the paper. These bags measure approximately 18x24x8 inches, or 1¼ cubic feet.

Quick lime should be stored in a room or bin with as little air circulation as possible, as it will deteriorate rapidly if subjected to moisture or air currents. A coating or film of air-slaked lime forms over the surface in the same way that rust or oxidation takes place on iron, protecting the mass from further slaking if not disturbed. However, unless the consumption is large and the lime is used regularly, it will usually be more economical to use hydrated lime in the paper bags, even though the water of combination amounting to about 23 per cent must be deducted. There are a number of other advantages in favor of hydrated lime, such as uniformity, cleanliness, elimination of weighing operations, greater ease in handling, and more satisfactory storage.

ROSIN AND ROSIN SIZE

By R. H. STEVENS

ROSIN is the name commonly applied to the residue obtained on steam distillation of the oleoresin exuded by several species of pinus. In the United States the most important species exploited are the longleaf pine (P. palustris) and the slash pine (P. caribea). Exudation of the oleoresin, which is a pathological product (not the sap), is stimulated by superficial wounding of the tree. The material is collected in pots of earthenware, aluminum, or galvanized iron. After distilling off the turpentine oil the residue is tapped off, strained through cotton batting and packed into barrels of either wood or galvanized iron making about five hundred pounds gross weight. This is sold on the basis of the standard barrel of 280 lb. gross. The barrels average about 85 lb. tare so the net weight is around 415 lb., or 235 lb. for the purely fictitious standard barrel.

In addition to the gum rosin prepared in this way there is also a kind known as wood rosin obtained by extracting pine wood (chiefly old stumps) with gasoline. This is packed and sold in the same way.

Under the Harrison Naval Stores Act all rosin must be graded by government inspectors. Grading is done on the basis of color, the different grades being represented by letters, viz. B, D, E, F, G, H, I, K, M, N, WG, WW and X. Paler grades are represented by letters farther along in the alphabet. Wood rosin usually has a ruby tint and is frequently sold under a trade-mark in addition to the mandatory color type, of which F is the most common.

Rosin, either gum or wood, is an amorphous brittle solid with conchoidal fracture, specific gravity 1.05 to 1.07, melting point (drop method) 75 deg. C. to 85 deg. C., completely soluble in the ordinary solvents such as acetone, alcohol, benzene, chloroform, carbon disulphide, ether, petroleum spirit, turpentine, etc. Its chemical composition is still somewhat uncertain but it is pretty generally conceded to consist chiefly of an acid (abietic) of molecular weight around 302 with which is associated a certain amount of anhydride, or possibly a polymer, as the acid number usually ranges from 150 to 170 with the average around 162 instead of 185. This (162) corresponds to a molecular weight of 346. The saponification number is a little higher than the acid number, but the difference does not appear to indicate presence of an ester. It may be due to some condensation between molecules of the acid, which appears to contain a lactone group.

To prepare it for sizing, rosin is saponified either partially or completely according to whether it is desired to make a free rosin size or a neutral size. Saponification is usually accomplished by cooking with a solution of soda ash or caustic soda. Preferably the rosin is melted by means of a steam coil placed above a sieve through which it drips in threads into a boiling solution of soda ash. Thus a large surface of the rosin is exposed to the solution and reaction is facilitated. A good free rosin size may be prepared by using 13 per cent of soda ash, calculated on the weight of rosin. Approximately one-fourth the rosin will be unsaponified. Although a majority of papers are sized with a free rosin size, there does not seem to be any real difference in the sizing effect per pound of rosin between this and the neutral size. There is a small saving in alkali in making the former and also in the alum required to decompose it, but its use is sometimes attended with difficulties unless an emulsifier is used in preparing the milk, as the dilute solution in which it is commonly used, is called.

Recently a process has been introduced into this country for preparing size without cooking. A cold solution of caustic soda is allowed to percolate over lumps of rosin. This yields a neutral size of uniform concentration (about 5 per cent).

For mills preparing their own size, the most important requirement in the quality of rosin used is cleanness. Wood rosins are usually free from dirt and many of the gum rosin producers are careful to avoid contamination also. Unfortunately, however, the gum product is largely lumped together by the factors and the consumer cannot be sure of buying the product of a careful operator. Next to cleanness the amount of unsaponifiable matter and of material insoluble in petroleum ether are matters of chief concern. Both are without sizing power and the former may be a source of trouble on account of pitch.

Probably most of the rosin size used in this country is prepared by manufacturers who supply it to the paper mills. It is shipped in tank cars or in steel drums of 55- and 110-gal. capacity. This liquid size may contain from fifty to seventy per cent of solids and from as much as 45 per cent free rosin down to a neutral size.

The size manufacturers have also recently perfected a dry rosin size. This has the advantage of saving in freight on water. Also since it can be packed in bags there is additional saving in freight on containers. The dry size is usually neutral or contains only a small amount of free rosin. Consequently it can be dissolved or emulsified quite readily. Or in mills using beaters the dry size can be added to part of the furnish water and dissolved before addition of the stock.

The use of rosin size was formerly often attended by difficulties, but with the development and popularization of pH technique during the past decade this has largely been eliminated. With proper care in emulsifying and incorporating uniformly into the stock and with judicious control of the addition of alum by means of pH measurements there is no longer any excuse for either faulty sizing or for blaming the size maker for pitch troubles. Local conditions such as character of water, peculiarities of stock, or even climatic variations may sometimes cause difficulties which formerly were often thought due to poor quality of rosin size. Usually, however, these can be overcome by careful attention to pH.

With the modern tendency toward continuous treatment of stock has come continuous addition of size. This is usually before the jordans with the addition of alum after the jordans.

SALT CAKE

By I. V. WILSON, Chemical Engineer
Merrimac Chemical Company

SALT cake is a co-product in the manufacture of muriatic acid from common salt and sulphuric acid. It is crude sodium sulphate, with a name that refers to its origin rather than composition.

In the manufacture of muriatic acid, common salt and sulphuric acid are brought together in a furnace so designed that the process is continuous. Muriatic acid being a gas passes off and is dissolved in water to form the muriatic acid of commerce, while the sodium sulphate formed by the reaction is a solid and is removed continuously.

There are two reactions involved in the process: First, one molecule of salt reacts with one-half molecule of sulphuric acid to form one molecule of muriatic acid and one molecule of sodium bisulphate.

Second, one molecule of salt reacts with a molecule of sodium bisulphate (the other half of the sulphuric acid molecule) to form another molecule of muriatic acid and a molecule of sodium sulphate. In other words, two molecules of salt react with one of sulphuric acid in two stages. Because of this, the process is often run without sulphuric acid at all, but using salt and sodium bisulphate as nitre cake. The products formed are the same except that per given amount of muriatic acid there will be formed twice as much salt cake.

Nitre cake is sodium bisulphate formed as a co-product in the manufacture of nitric acid from sodium nitrate and sulphuric acid. Its name, as in the case of salt cake, describes origin rather than composition.

If salt cake is in demand and nitre cake is not, then nitre cake is used as a raw material.

The quality of salt cake is, of course, dependent upon the raw materials used in the manufacture of muriatic acid. Any non-volatile impurities occurring in the salt, sulphuric acid or nitre cake will be found in the salt cake. If the furnaces are not operated correctly, the reactions may not be complete and the result is a salt cake containing relatively large amounts of salt and sulphuric acid.

As it comes from the furnace, the salt cake is a white granular solid ready for the market. The average commercial product will analyze approximately as shown below. Another grade is produced which is furnaced longer to reduce the amount of salt and sulphuric acid, making it more suitable for glass making.

$CaSO_4$	.75- 1.5 per cent
$Fe_2(SO_4)_3$	.15- .50 per cent
Insoluble	.30- .80 per cent
H_2SO_4	1.50- 2.50 per cent
NaCl	.50- 1.00 per cent
Na_2SO_4	94.00-96.00 per cent

Salt cake melts at between 860 and 897 deg. C. The solubility is very greatly affected by temperature, 19.4 grams being required to saturate 100 c.c. of water at 20 deg. C., and 48.8 grams at 40 deg. C. Its specific gravity is about 2.67 at 15 deg. C., but in the dry form a cubic foot has been found to weigh about 85 pounds.

Because all salt cake contains some sulphuric acid, it takes up moisture from the air and will form a hard cake. Caking depends upon the conditions of storing and packaging. If the material must be free flowing, shipments are made in tight barrels or metal drums. Otherwise, shipments are made in slack barrels or in bulk. Bags are unsatisfactory as the acid rots them.

Glass, chemical and pulp industries are the consumers of salt cake. Glass makers use it as a constituent of certain types of glass. Chemical manufacturers as a raw material for other chemicals, and pulp manufacturers in the manufacture of sulphate pulp.

The chemical industry uses salt cake to make Glauber's salt and sodium sulphide. Glauber's salt is sodium sulphate with ten molecules of water of crystallization. It is made by dissolving salt cake in water, neutralizing with soda ash, filtering the insoluble matter out and concentrating until the Glauber's salt crystallizes out. The iron and calcium salts are rendered insoluble on neutralization and are removed with the insoluble matter. Sodium sulphide is produced by heating salt cake and finely ground coke in a furnace at high temperatures under proper conditions. The sodium sulphate is reduced to sulphide. It is this reaction that makes salt cake suitable for the pulp industry.

The sulphate process of making pulp predisposes the use of salt cake or sodium sulphate to replace the chemicals lost in the pulping process. The name of the process is derived from this fact, but is a misnomer as the liquor actually used in the process is a mixture of sodium sulphide and sodium hydrate. Likewise, to designate as kraft all pulp produced by the sulphate process is incorrect, as kraft is sulphate pulp intentionally undercooked to produce greater strength.

In the sulphate process wood chips are cooked under pressure in a liquor containing sodium sulphide to the extent of about 25 to 30 grams per liter and sodium hydrate about 65 grams per liter. Other chemicals, such as sodium carbonate, sodium sulphate and sodium sulphite, are also present as unavoidable products of the process, but are not effective as pulping agents.

The spent liquors of the cook and the pulp wash water are concentrated by evaporation and then burned. The combustion is not complete and the ash is very largely sodium carbonate and carbon, and because of its color is called black ash. To this ash is added the salt cake to replace the chemicals lost in the process and the mass is run into a furnace, similar to the one used in the chemical industry to produce sodium sulphide. The carbon present supplants the coke used in the chemical industry and the sulphate is reduced to sulphide. All of the carbon is not burned from the mass which is drawn from the furnace in a molten state. It is cooled, dissolved in water to separate out any insoluble matter and the clear liquor drawn into another tank. The alkali present in this liquor is sodium carbonate. To convert it to sodium hydrate, an effective pulping agent, hydrated lime is added. The calcium carbonate formed by this reaction is insoluble and is removed, leaving a pulping liquor of the same composition as originally made up.

SILICATE OF SODA

By F. M. SUAREZ
Philadelphia Quartz Company

FOR more than forty years, silicate of soda has been known as a sizing material for paper. Its use in the beginning was largely by the cut and try method. Within the past few decades, however, the scientist has found the explanation of its usefulness which has been closely linked to a better understanding of the properties of silicate.

The benefits from silicate of soda in the beater usually are discernible to the skilled eye of the papermaker. Benefits such as strength and ink resistance are definitely measurable. The full value of silicate of soda can be obtained only by a reaction brought about with alum. Like rosin, silicate is neutralized with alum. In the beater, the product of the silicate and alum is a light, flocculent material which when dried hardens the sheet and increases its strength. If some of this flocculent precipitate were allowed to dry, it would be found too hard to crush easily in the hand. In this hardened condition, however, it still retains considerable water, to which it owes its toughness. When in the finished sheet, the apparently dry precipitate contains at least 25 per cent of water.

The evidence of the retention of the precipitate is shown by an increase in the ash content of the paper. Mill operations over a period of years show an average of 1 per cent increase in ash. In a special study[1] which involved 550 tons of paper and 1,200 samples, the average increase in ash was 1 per cent with an average addition of 3.48 per cent of liquid silicate based on dry fiber. The amount of dry alum necessary for the precipitation of the silicate was 25 per cent of the weight of the silicate solution. The average retention was 66 per cent of the total silica in the silicate, plus the Al_2O_3 of the alum. There is good reason to suppose that the use of larger proportions of silicate would not only produce more marked effects on the paper but would be accompanied by a higher percentage retention.

To increase the output as shown by the increase in ash in many cases alone, is justification for the use of silicate in the beater. Sometimes the increase in output from a given amount of stock may be up to 30 pounds per ton, with a corresponding saving in beating time of from 30 per cent to 25 per cent. One mill found that a saving of 30 minutes beating time on a schedule of 1½ hours was possible.

The property of silicate which enables paper stock to be beaten in a shorter time is primarily its ability to increase the speed of hydration. Silicate of soda, before the addition of its alum, furnishes an alkalinity which hastens hydration. This hydration effect is stopped when the alum is added to make the beater acid.

On the matter of quality the improved hardness and finish of the paper must be determined by the judgment of the experienced papermaker as there is no satisfactory available method of reducing these qualities to a numerical standard. All papers where hardness is desired are improved in this specification by the judicious addition of silicate of soda to the beater. Silicate is widely used in cheaper sulphite bonds to give them a good crackle or rattle. Fuzz elimination is one of the important benefits of silicate in a number of different kinds of paper. The voluminous, flocculent masses caused by the precipitation of the silicate by the alum, are distributed among the fibers where they assist in preventing the escape of the smallest fibers.

The same action that holds the small fibers also increases the retention of fillers—starch, rosin, clay, etc., and color. In one case it was found that the retention of 10 per cent more clay netted a substantial saving.

The criterion of whether the papermaker gets the full benefit of silicate lies in its manipulation and also in the choice of the grade. As pointed out, if the amount of alum added is insufficient no precipitation occurs, and without precipitation the advantage of using silicate is lost. The correct amount of alum brings the pH in the beater to a point near 4.6.

The conditions of making paper and the objects sought are so various that it is difficult to make general recommendations. It has been found that proportionately better results are obtained with more than minimum quantities of silicate, that is, a given effect will be greater per pound of silicate when silicate is used at a concentration of 6 per cent based on the fiber stock, than if only 3 per cent were used.

Since alum is used for the precipitation of silicate of soda, a silicate with the smallest amount of soda will effect a saving in the quantity of alum to be used. The lowest alkalinity which is practical from a commercial viewpoint is represented by a solution containing 7 per cent total alkali as Na_2O and a ratio of soda to silica approximating 1 to 4. A silicate of lower relative alkalinity is too nearly insoluble to be economical for this use.

Silicate of soda is somewhat analogous to paper because of the different grades which can be made. By varying the proportions of the ingredients a wide range of silicates of soda results, each with a set of different characteristics. These diversified properties fit into a number of totally different processes in the paper mill, and paper literature of recent years includes interesting new applications. In a series of studies[2] of solvents for casein for coating paper, it was found that silicate of soda in the formula permitted greater spread as well as improvement in the water resisting quality of the sheet.

Sodium metasilicate is one of the newest members of the silicate of soda family, and is covered by U. S. Patent 1,898,707 issued to the Philadelphia Quartz Co. It is an alkaline salt having a definite chemical composition, $Na_2SiO_3 \cdot 5H_2O$. U. S. Patent 1,914,798, issued to George L. Bidwell, relates to its use for adding sheen to glassine paper. It also is an ideal cleanser and many mills are using it for the cleaning of felts.

[1] Vail, *Soluble Silicates in Industry.*
[2] Michigan Engineering Experiment Station Bulletin.

SODA ASH and CAUSTIC SODA

By HARVEY G. ELLEDGE, Ph. D.
Research Director, Diamond Alkali Company

SODA ash as commercially supplied today is nearly chemically pure anhydrous sodium carbonate. It is a white more or less grainy powder of true specific gravity 2.43 to 2.5. Taking the latter figure, a fused block of one cubic foot volume would weigh 156 pounds or a value only 12½ pounds less than a similar volume of limestone. The apparent specific gravity or the calculated weight of a cubic foot of the commercial soda ash is in the neighborhood of 34 pounds.

On the crystal structure of soda ash the usual source books for such information have nothing to say. This is rather remarkable when it is considered that crystal structure is one of the most important physical earmarks in the identification of most solid compounds. As a matter of fact the particles which give the grainy feel to the powder are skeletons, so to speak, of the sodium bicarbonate crystals from which they were formed. Sodium carbonate has a melting point of 1560 deg. Fahr. and may be melted at this temperature in an atmosphere of carbon dioxide without chemical change. Even when melted in an atmosphere of air the decomposition is hardly detectable. The latent heat of fusion; viz., the heat necessary to liquefy the soda from and at 1560 deg. Fahr. is 147 B.t.u.

Anhydrous caustic soda is a white translucent solid of a specific gravity of 2.13 or 133 pounds per cubic foot. It has a crystalline fracture. It melts at 605 deg. Fahr. with a latent heat of fusion of 72 B.t.u. per pound.

Sodium carbonate is expressed by the chemical formula Na_2CO_3 indicating a molecular weight of 106 and a reacting equivalent weight of 53. This means among other things that it is composed of 46 parts sodium, 12 parts carbon and 48 parts oxygen, and that 53 parts will neutralize 36.45 parts of hydrochloric acid to form 58.45 parts of common salt. It is practically insoluble in the common organic solvents such as alcohol, ether, chloroform and carbon tetrachloride. It is quite soluble in water, showing a maximum solubility of 33.8 per cent (basis solution) at 35.4 deg. C. (about 96 deg. Fahr.).[1] The water solutions exhibit the usual properties of electrolytes, details of which are beyond the scope of this article. As is true of all salts of a strong base and a weak acid, sodium carbonate shows a marked tendency to hydrolyze and as a result of this hydrolysis a certain definite concentration of hydroxyl ions is available.[2] This property of sodium carbonate is of great interest in the boiling of rags and the preparation of size and other uses where a mild alkali is required.

Sodium hydroxide (caustic soda) is expressed by the chemical formula of NaOH, molar weight 40 and reacting equivalent of 40. Sodium hydroxide, unlike sodium carbonate, is soluble in alcohol. It is quite readily soluble in water and it is to its water solutions that the present interest is applied. It is the strongest of the water soluble alkalies, and it is because of its greater solubility than lime that the addition of this chemical to the cooking batch for straw, for instance, has such a pronounced effect on the resulting cook. Also the soaps formed by the reaction of caustic soda on fats and resins are water soluble, whereas the similar soaps of lime are very insoluble.

The sulphate process and the soda process for cooking pulp depend on caustic soda as the essential reagent. The conversion of the waste liquor back to green liquor is in a way analogous to the LeBlanc soda process. The causticizing of green liquor, whether the make-up alkali is salt cake as in the sulphate process or soda ash as in the soda process, parallels the procedure employed in making chemical caustic. There are a number of qualifying details imposed on the manufacturer of marketable caustic that are not required in the soda recovering procedure in pulp manufacturing:

$$Ca(OH)_2 + Na_2CO_3 = 2NaOH + CaCO_3$$

represents the basic reaction. With concentrations of $Ca(OH)_2$ and Na_2CO_3 required to yield a 10 per cent NaOH solution the reaction proceeds to an equilibrium in which 85 per cent to 94 per cent of the Na_2CO_3 is converted to NaOH. Such a residual of unchanged Na_2CO_3 is not objectionable or may be even desirable in pulp cooking liquors while with the alkali manufacturer the unconverted Na_2CO_3 must be separated from the NaOH liquor. The removal of the $CaCO_3$ resulting from the reaction is similar in each case. The clarified, relatively weak liquor containing the NaOH must be concentrated to produce the commercial forms of liquid and solid caustic soda.

Soda ash is shipped in bulk cars, in burlap bags containing 200 or 300 pounds, and in multi-wall valve paper bags containing 100 pounds.

Caustic soda 50 per cent NaOH liquor and 70 per cent NaOH liquor are shipped in tank cars. Solid caustic soda is shipped in steel drums containing 725 pounds. Flaked solid caustic soda is shipped in steel drums containing 50, 100 and 400 pounds. Flaked caustic soda may be had in four sizes ranging from large flakes to small grains.

Soda ash is used in pulp and paper for a variety of purposes which is estimated to be approximately 7 per cent of the total soda ash production. The most important use is as a source of alkali in the soda process. Other uses for soda ash are in the processing of rags for rag paper, de-inking of news print, conditioning of boiler feed water, and preparation of size and coating materials.

Conceivably caustic soda could be used in adjusting the strength of cooking liquor, especially to obtain a little higher strength than can be had by direct causticization of soda ash. Caustic soda is sometimes if not generally preferred to soda ash for cooking rags. It may be used and is often preferred for preparing casein and resin sizes. Caustic soda is also used in the production of specially pure cellulose by alternately chlorinating the pulp and treating it with caustic soda solution.

[1] See temperature solubility curve, *Diamond Alkali Handbook*, p. 26.
[2] *Ibid*, p. 52.

SODIUM CHLORIDE

C. D. LOOKER, Ph. D., Director of Research
International Salt Company

SODIUM chloride, or common salt, is composed of almost 40 per cent sodium and slightly more than 60 per cent chlorine. With these two elements as a starting point the entire alkaline and chlorine industries could be maintained. Sodium chloride is the starting point for all of the compounds of sodium. Sodium and chlorine enter into different chemical combinations to form many articles of commerce as well as many intermediates.

Sodium chloride is a pure white compound that occurs naturally as rock salt in practically every country in the world. It also occurs in certain localities as natural brine and constitutes about 2.8 per cent of the composition of sea water. In the United States, salt is obtained by rock salt mining and by evaporation of brines.

Rock salt is mined like coal, is crushed at the mines and screened into four or five sizes required by the trade.

Brines are of three kinds: (1) sea water or water from salt lakes; (2) natural; and (3) artificial, which is made by pumping water into wells drilled into the rock salt bed. Salt from sea water and salt lakes is prepared largely by solar evaporation. Salt from natural and artificial brines is prepared by evaporation in vacuum pans and grainers.

Salt prepared by the vacuum pan method is cubical, while that prepared by the grainer method is in the form of "hoppers" or flakes. Flake salt is more bulky than cube salt, so that a given volume of flake salt weighs only about two-thirds as much as the same volume of cube salt.

Salt cubes have a specific gravity of 2.163, that is, a solid cube of salt weighs 2.163 times as much as an equal volume of water at 39.16 deg. Fahr. The relative density of a mass of salt cubes, on the other hand, is about 1.25 and of salt flakes is about .86.

Pure sodium chloride melts at 1479.2 deg. Fahr. and the fused salt boils at 2575.4 deg. Fahr. The solubility of salt in water is 26.2 per cent at 32 deg. Fahr. and 28.1 per cent at 212 deg. Fahr. Its solubility at minus 6 deg. Fahr. is 23.3 per cent. This is called the eutectic composition. Salt ice formed from such a solution has a constant melting point of minus 6 deg. Fahr. and a latent heat of fusion, or heat absorbing capacity, of 101.5 B.T.U. per pound. At standard atmospheric pressure, saturated brine boils at 227.6 deg. Fahr. and contains 28.4 per cent sodium chloride. Saturated brine at 60 deg. Fahr. contains 26.4 per cent pure sodium chloride and has a specific gravity of 1.205.

The principle impurities in rock salt are water insoluble shale and anhydrite as well as water soluble, calcium sulphate, calcium chloride, magnesium sulphate and magnesium chloride. The water soluble impurities are also the principal ones in evaporated salt. The rock salt mined in the United States averages about 98.3 per cent pure sodium chloride. About 0.89 per cent of the impurity in rock salt is insoluble in water. Most of the evaporated salt exceeds 99 per cent pure sodium chloride and some of it is guaranteed to be purer than 99.8 per cent. Practically all of the impurity in salt, prepared by evaporation, is soluble in water.

Both rock salt and evaporated salt are shipped in bulk by train and boat, in barrels, also bags of 50, 100 and 200 pounds, and in 10 and 25-pound pockets. The purer grades of salt are packed in paper lined barrels and bags as well as in moisture proof boxes.

When salt brine is subjected to the action of an electric current, chlorine is produced at one pole and caustic soda and hydrogen at the other. Purified brine from rock salt is generally used for this purpose. The rock salt is dissolved in a salt box or barrel or in an automatic rock salt dissolver. All of the chlorine of commerce and a large percentage of the caustic soda and hydrogen are made by the electrolysis of salt brine. Some of the hydrogen is made to react with chlorine to produce hydrochloric acid. Chlorine is also made to react with caustic soda to produce sodium hypochlorite solution.

Salt is used to set the color during the dyeing of paper stock. Fine mesh evaporated salt is preferred for this purpose because of its purity and rapidity of dissolution.

One of the principal uses for salt as salt at a paper mill is to regenerate zeolite water softeners. Zeolites, as purchased, contain a sodium base which is replaced by calcium and magnesium bases when hard water is run through them. When they have absorbed enough calcium and magnesium to reduce their efficiency, they are restored to their original condition by washing with nearly saturated brine. Evaporated salt is sometimes used for this purpose, but it is much more economical to make clear, pure, filtered brine from rock salt by using an automatic rock salt dissolver.

In dissolving rock salt, it is important to know that calcium sulphate (anhydrite), the principal impurity, is relatively more soluble in brine than in pure water. It reaches its maximum solubility in brine between 45 and 65 degrees salometer or between specific gravities of 1.083 and 1.125. One gallon of water at 73.4 deg. Fahr. will dissolve 0.01441 pounds of calcium sulphate whereas one gallon of brine having a density of 1.083 will dissolve 0.0627 pounds of calcium sulphate. Saturated brine, on the other hand, dissolves 0.0443 pounds of calcium sulphate per gallon or slightly less than the more dilute brine mentioned above.

The solubility of calcium sulphate in brine or water does not change appreciably with a rise in temperature from 68 deg. to 185 deg. Fahr. It averages approximately 0.0690 pounds calcium sulphate per gallon in 20 per cent brine. Its solubility in water at 68 deg. Fahr. is 0.01444 pounds per gallon and at 185 deg. Fahr. 0.01401 pounds per gallon or not quite one-fifth as soluble as in 20 per cent brine.

Since, therefore, neither the solubility nor rate of dissolution of rock salt and calcium sulphate in water changes materially with a rise in temperature, there is only a slight advantage in using hot water to dissolve salt.

CORN STARCH

By PAUL TORRE[1] and LOWELL GILL[2]

CORN is the source of nearly all of the starch and starch products used by paper mills in the United States. It occurs in the grain along with protein, fiber, oil and mineral matter and in the process of purification it is separated from these other constituents by mechanical means. The resulting product is a white, powdery substance containing only minute traces of impurities. The individual units, called cells, in which starch occurs can be distinguished by suspending some of them in water and examining them under the microscope. The distinguishing characteristics are the fairly small size of the cells (diam. 0.015 mm. to 0.030 mm.), the irregular, angular outline and the location and shape of the dark cross (hilum) on some of the cells.

The characteristic which makes starch useful to the paper manufacturer is its ability to adsorb water and form a gelatinous, adhesive, colloidal solution. Cold water has no effect upon starch but beginning at about 150 deg. Fahr. and increasing as the temperature is raised, the starch cells swell to many times their original size, the viscosity of the suspension increases very greatly and upon cooling, if the concentration is high enough, the paste sets to a rigid jelly.

The physical properties of starch can be changed in a number of ways and some of these changes can take place without any alteration in the microscopic appearance of the starch. The most common methods of modifying starch commercially are hydrolysis and oxidation, and the most noticeable effect of either method is a reduction in viscosity of the paste which the starch will make when heated with water.

Modification by hydrolysis is carried out by adding a little acid to starch suspended in water and warming the mixture. By controlling the time, temperature and amount of acid, the properties of the resulting starch, particularly its viscosity, can be controlled within narrow limits and several different products (the thin boiling starches) are made by this method. Corn syrup (glucose) and corn sugar are produced by this general method but using a much higher temperature. Heating dry starch with acid produces the commercial dextrins (white, canary, etc.).

Modification by oxidation is carried out by adding an oxidizing agent, generally sodium or calcium hypochlorite, to starch suspended in water. The degree of modification is controlled by the amount of oxidizing agent used. Oxidation can produce products giving thinner, clearer, more gelatin-like solutions than acid hydrolysis can.

Starch or its conversion products are used by the paper industry for beater sizing, surface sizing in the tub and on the calenders and as an adhesive for laminating sheets into board and for binding the mineral matter in coating.

Natural starch (Pearl) is used for beater sizing and as an adhesive in making Bristol board and the like. Its high viscosity and its tendency to set to a rigid jelly limits its use as a surface size.

Starch modified by acid hydrolysis has practically the same characteristics as Pearl, except that it produces thinner pastes when cooked with water. Very little of it is used by the paper industry. Beater sizing tests indicate that it is but little better than Pearl for this purpose and its use for surface sizing is limited by the same consideration as apply to Pearl, although hydrolyzed (thin boiling) starch more nearly meets the requirements for this type of work. Corn sugar is used to some extent in the manufacture of glassine and parchment where it helps to reduce the brittleness. Dry acid conversion gives dextrins which are used as adhesives for combining board and the like.

The oxidation process can be made to produce a starch product having the characteristics desired for beater sizing, surface sizing and as an adhesive for coating with mineral matter. Oxidized starch is dispersed very thoroughly when cooked with water. When added to the beater, it acts as a protective colloid on the fibers and increases the sizing value of rosin size. Due to its low temperature of gelatinization, it can be used dry in the beater. Also it has great adhesive strength and, therefore, a considerable increase in the strength and sizing of the sheet are obtained with oxidized starch both in beater and tub sizing.

Its use in coating results in a fluid, free-flowing clay mix which is easily applied. In addition, the mineral is firmly bound to the sheet giving a permanent coating.

Starch is packed in: 100 lb. paper bags, 140 lb. jute or cotton bags, 280 lb. jute or cotton bags, and 280 lb. barrels with paper liners. The jute bags may or may not be paper lined, according to the wishes of the user.

Starch Analysis

	Pearl	Hydrolyzed	Oxidized
Form	Granular	Granular or Powder	Granular or Powder
Color	White	White	White
Spec. Gravity	1.500	....	....
Spec. Heat	0.030	....	....
Acidity—% HCl	0.061	0.050	0.070
Moisture	12–14%	10–13%	10–13%
Water Soluble	0.16%	0.02%	1.16%
Viscosity (boiling)	Very thick	Fairly thick	Thin
pH	4.5	5.0	4.8
Ash	0.075	0.100	0.540
Protein	0.320	0.230	0.170
Oil	0.230	0.170	0.120

Beater Sizing Tests

	Without Starch	2% Pearl	2% Hydrolyzed	2% Oxidized
Basis Weight	50.0	50.0	50.0	50.0
Mullen	28.5	37.5	39.4	43.7
% Increase	...	31.5	38.3	53.3
Ink Penetration	140 sec.	175″	230″	385″
% Increase	...	25.0	64.3	175.0

Tub Sizing Tests

	Unsized	Hydrolyzed	Oxidized
Basis Weight	49.5	52.9	52.4
2% Increase	...	6.9	5.9
Mullen	30.5	27.0	28.1
% Increase	...	31.7	37.1
Ink Penetration	130″	355″	410″
% Increase	...	173.2	215.5

[1]Member T.A.P.P.I.—Research Chemist—A. E. Staley Mfg. Co., Decatur, Ill.
[2]Research Chemist—A. E. Staley Mfg. Co., Decatur, Ill.

SULPHUR

By A. E. MARSHALL
Consulting Chemical Engineer

SULPHUR, possibly because it existed in elemental form in the Mediterranean countries—those centers of ancient civilizations—has been known from very early times, and certain of its uses, particularly for bleaching and fumigating, are frequently mentioned by the classic writers.

The combustibility of sulphur and the ease with which it could be combined with certain metals made it a favorite material for alchemistic studies, so when Paracelsus developed his theory that every substance was made of three primal elements he named them sulphur, mercury and salt; explaining that sulphur burned, mercury distilled and salt remained.

While deposits of elemental sulphur are widely scattered over the earth's surface and there is a still wider distribution of sulphur combined as sulphides and sulphates, few of the elemental deposits and sulphide ores are present in sufficient amounts in one locality to make extraction or mining profitable.

Fortunately the United States has in the Gulf Coastal Plain area, more particularly in Texas and Louisiana, the world's largest known sulphur deposits, these deposits furnishing approximately 85 per cent of the present world requirement for elementary sulphur, a contrast with thirty years ago when we produced less than 1 per cent of the world's total output and had to rely on Sicily for the major part of our supply.

Sulphur is recovered from these Gulf Coast deposits by an interesting process devised by Herman Frasch over forty years ago. Wells are drilled to the sulphur bearing strata, and composite casings made up of three concentric pipes are set in place. The annular space between the outer and intermediate pipes conveys superheated water into the formation where it melts the sulphur, which being heavier than water percolates downward to the foot of the well. An ingenious system of perforations permits the molten sulphur to rise in the annular space between the central and intermediate pipes, and compressed air liberated from the central pipe provides an air lift effect which carries the sulphur upward through this annular space to the surface. Jacketed collecting lines convey the molten sulphur from individual wells to gathering stations, and from these the sulphur is pumped to gigantic wooden vats where it solidifies.

Sulphur is an important industrial raw material and Liebig's dictum of eighty years ago, "We may judge, with great accuracy, of the commercial prosperity of a country from the amount of sulphuric acid it consumes" is equally true today, particularly if we substitute sulphur for its derivative sulphuric acid.

Sulphur and its compounds are essential materials for practically all papermaking processes, and in the sulphite pulp process the cleanliness of sulphur dioxide gas made by burning sulphur, the convenience of control of gas strength and the absence of dusty residual by-products has made elemental sulphur the preferred source of the dioxide.

Sulphur burns readily in air, consequently sulphur burning equipment was initially of simplest design until sulphuric acid makers, faced with the need for burning larger tonnages, without excessive additions to the space devoted to burners, began to use mechanical types and finally developed methods quite analogous to fuel oil burners, and burned sulphur by spraying it into a combustion chamber in the fluid molten state. In certain types of contact acid plant the sulphur dioxide from the combustion chamber passes through a special type of steam boiler which not only cools the gas but yields useful amounts of process steam. Because sulphur dioxide resulting from the burning of sulphur in air always contains traces of sulphur trioxide, steam boilers used as gas coolers must be carefully proportioned to the load so that exit gas temperatures can be held above the condensing point of sulphuric acid and corrosion avoided. The fact that some trioxide is always formed when sulphur is burned is sometimes overlooked, and as a result equipment which may be entirely satisfactory in design is blamed for difficulties which would not exist if proper steps had been taken to take care of the inevitable formation of traces of trioxide. Sulphur dioxide from pyrites contains much more trioxide, the pyrites cinder acting as a catalyst, in fact, in the early days of contact acid manufacture, pyrites cinder was used as a catalyst and 60 per cent conversions to trioxide obtained.

The chemical and physical properties of sulphur, as recorded in scientific literature, are not always concordant despite the fact that investigators reporting different results worked with practically pure sulphurs. The differences arise from the existence of several allotropic forms and the chance that more than one form was present in the sample used by the investigator.

Texas and Louisiana sulphurs mined by the Frasch process are unusually pure raw materials, the sulphur content being over 99.8 per cent. Such sulphur has a melting point of approximately 114.5 deg. C., and the viscosity just above the melting point is quite close to that of water—hence the feasibility, for sulphur dioxide manufacture, of using spray burners and pumping fluid sulphur to points of use from a common molten storage.

The specific gravity is 2.07 for solid material at 0 deg. C. and 1.81 for fluid sulphur at 120 deg. C., thus the desirability of placing melting tank outlets toward the top. The ignition temperature of sulphur vapor is 250 deg. to 260 deg. C. and the boiling point is 444.6 deg. C.

Other properties of sulphur, such as viscosity expansion co-efficient, thermal and electrical conductivity, specific heat, and magnetic susceptibility vary with the temperature, but space limitations forbid inclusion of these constants over the temperature ranges encountered in practice.

A collection of data on sulphur, without critical analysis of any of the values, will be found in Volume 10 of Mellor's *Treatise on Inorganic and Theoretical Chemistry.*

TITANIUM PIGMENTS

By WILLIAM R. WILLETS, Paper Chemist
Titanium Pigment Company, Inc.

TITANIUM, which comprises about 0.58 per cent of known terrestrial matter, is a member of the carbon group according to Mendeleeff's periodic table and has a characteristic valence of four. This carbon group may be divided into two families: *A* comprising zirconium, cerium, thorium and titanium; and *B* comprising carbon, germanium, lead and silicon.

The most important sources of titanium are ilmenite (theoretically an iron titanate, $FeTiO_3$ or $FeOTiO_2$) and rutile,—a natural titanium dioxide (TiO_2) ore.

Titanium dioxide and composites of the dioxide with blanc fixe or calcium sulphate are the titanium pigments of interest to the paper industry. In the manufacture of these pigments, the concentrated ore is pulverized and treated with hot sulphuric acid, resulting in a mixture of titanous and ferrous sulphates. By various methods, extraneous materials and iron are removed from this mixture and a clarified solution of titanous sulphate remains. For the composite pigments titanium dioxide is precipitated by hydrolysis at slightly elevated temperatures and pressures on blanc fixe (for Titanox-B and Titanox-B17) or on calcium sulphate (for Titanox-C). If Titanium Dioxide (Titanox-A) is desired, no base is used. The pigment is then thoroughly washed, calcined, ground, etc.

Some properties of the titanium pigments are:

	Titanox-A	Titanox-B	Titanox-B17	Titanox-C
Composition—				
Pure Titanium Dioxide (TiO_2)		25% TiO_2 75% $BaSO_4$	17% TiO_2 83% $BaSO_4$	30% TiO_2 70% $CaSO_4$
Color—	White	White	White	White
Form	Roundish amorphous aggregates			
Average size— (Aggregates)	0.3 microns	0.55 microns	0.55 microns	0.55 microns
Specific gravity—	3.9	4.3	4.3	3.1
Melting point—	1560°C.	...	...	...
Solubility—	Insoluble in water, dilute acids and alkalies			$CaSO_4$ base slightly soluble in water
Chemical activity—	Absolutely inert under all papermaking conditions, no reactivity with size, silicate, alum, casein, etc.			
Refractive index— (Air 1.00)	2.55	1.90	...	1.91
Brightness—				
Dry	96%	96%	96%	96%
In glycerine	93.5%	93.5%	93.5%	93.5%

These properties render titanium pigments suitable for the manufacture of exceedingly white, bright and opaque papers.

It is generally known that if the index of refraction of a filler differs greatly from that of cellulose, the opacity resulting from its use will be correspondingly great. Consequently, the ordinary fillers used in paper (such as clay, talc, asbestine, etc.), which all have indices of refraction similar to that of the cellulose fiber (about 1.53) develop little or no opacity, even when used in large amounts. However, the titanium pigments, which all have high indices of refraction, develop a high degree of opacity, and likewise (because of their high light reflection) a high degree of brightness. Incidentally, only relatively small amounts of the titanium pigments need to be used to obtain the desired effect, thus obviating the necessity of a high filler content, with subsequent weakening of the sheet.

Not only do the titanium pigments greatly improve the opacity, whiteness and brightness of paper, but they are unaffected by the pH in the beater or in subsequent papermaking operations. When used as beater additions, the pigments are retained much better than the ordinary paper fillers. (However, it should be noted that Titanox-C is rarely used in the beater because of the solubility of the calcium sulphate base.) Their high degree of water-dispersion makes them exceedingly useful as a constituent of surface size or of the coating mix. Because of their fineness and freedom from grit the pigments cause no undue wear on papermaking and printing equipment; this property likewise results in an excellent printing surface which results in the optimum appearance of half-tones, etc.

Titanium pigments have found considerable usage in book papers where a high degree of opacity and brightness is desired. Not only do they develop these properties, but because of the difference between the indices of refraction of the pigments and the printing ink vehicle, "show-through" is reduced to a minimum. In this case, the pigments are generally used as beater fillers.

However, in envelope papers, the pigment is also being used with surface size. In this case the pigment is thoroughly wet, mixed with the size, and the suspension applied in the sizing tub in the usual way.

Small amounts of the pigments, added to the furnish of a bond paper, will greatly improve its appearance without materially increasing the filler content and consequently reducing the strength. Here again, the fillers have been used in conjunction with surface size to produce similar effects, both Titanox-A and Titanox-C being so employed.

One of the largest fields for the titanium pigments in paper manufacture has been their use in the production of an opaque waxing stock which will retain its opacity and brightness after waxing. Naturally, this results in the better appearance of printed matter on the sheet.

All the pigments, but more especially the composites (Titanox-B, -B17 and -C), are finding considerable use as constituents of the coating color. Here again, their fineness, brightness and high white color play an important role. Likewise, in lightweight coatings, where opacity is an important factor, the high refractive indices of the pigments result in the optimum development of this property.

ZINC SULPHIDE PIGMENTS

By HOWARD M. CYR, Research Division
The New Jersey Zinc Company

THERE are three main grades of zinc sulphide pigments: namely, (1) commercial zinc sulphide (Zinc Sulphite Pigment- 20—XX Zinc Sulphide), (2) zinc sulphide pigment containing approximately 50 per cent blanc fixe (Zinc Sulphide Pigment-19—Cryptone), and (3) zinc sulphide pigment containing approximately 70 per cent blanc fixe (Zinc Sulphide Pigment-13 — Albalith). Where most striking results must be obtained with the smallest pigment content, XX Zinc Sulphide is the most desirable material. In cases where more pigment can be used and where certain surface qualities attendant upon higher pigmentation are desirable, the two extended pigments have been found preferable. In many cases these are also more economical.

The optical characteristics of zinc sulphide pigments account chiefly for their value in paper manufacture both for beater addition and for various coating processes. The essential characteristics for a powerful whitening power combined with opacity are high refractive index, a bright white color, and correct small particle size. The refractive index of 2.37 for zinc sulphide should be compared with 2.01 for zinc oxide, 1.65 for barium sulphate, 1.56 for clay, and 1.53 for paper. The brightness, as measured by the amount of white light returned from a dry block of the commercial pigment, amounts to about 95 per cent.

The average particle size of the individual crystals of zinc sulphide ranges from .25 to .5 micron (or .00001 to .00002 inch) but there often occur loose flocculates or aggregates of many of the particles forming larger groups.

The size of the individual pigment particles is so small that the openings in the finest mesh wire screens are large enough to accommodate an aggregate containing over half a million particles. The importance of uniform small size is apparent in the manufacture of a thin bond paper where pinholes would result from the use of a filler of large particle size. Calculations show that a row of 400 zinc sulphide particles of .25 micron in diameter would be necessary to reach from one surface to the other of a 20-pound bond sheet. Similar calculations show that a sphere reaching from one surface to the other would contain 64,000,000 individual particles.

When these pigments are properly dispersed in an aqueous solution, they remain in suspension for several days in spite of the high specific gravity of 4.0 for zinc sulphide and 4.45 for barium sulphate. Flocculating agents will, however, cause the pigment to form clumps and to settle out quickly, when this is desired.

The power of papers containing zinc sulphide to largely retain their optical properties under adverse conditions makes these pigments especially desirable. This is especially true in a waxed or oiled sheet which has low brightness and opacity when containing no high strength pigment. The same effect is noticed on severe calendering or in paper that is severely beaten, such as glassine.

A large number of the most popular paper dyes are actually easily dispersable fine solids which are readily adsorbed on paper fibers. For their resemblance in this respect zinc sulphide pigments might be regarded as dyes rather than as white fillers. Most ordinary white fillers have a relatively large particle size, low whitening or opacifying power, and are retained by mechanical filtration rather than by adsorption.

Zinc sulphide does not melt or boil under any normal conditions but sublimes readily only at the white heat of 1500 deg. C. Its solubility in water has been given as .0000065 gram per cc. It is chemically inert and will not attack any metals with which it may be in contact. However, if in contact with a solution of a heavy metal salt, it may precipitate this metal from solution. Zinc sulphide is non-toxic to man but acts as a mild antiseptic agent and tends to inhibit the growth of slime organisms found in paper pulp. This property is especially valuable due to its purifying effect on slime accumulations in inaccessible pipes or corners difficult to make sterile by other means.

A study of the mechanism of slime inhibition indicates that the pigment particles apparently accumulate in the gelatinous slime, permitting a concentrated sterilizing action which soon results in the disintegration of the slime growths. The amount of pigment necessary for this action is a variable depending upon the type of organism present, the temperature, the acidity, and the food available. Systems containing from .2 per cent to .8 per cent of pigment have given uniformly favorable results. A similar beneficial effect is noted when either zinc oxide or zinc sulphide is used in a casein coating formula. The pigmented color remains sweet for several days under conditions where the unpigmented color spoils overnight.

Commercial zinc sulphide pigments in the form of lithopone have been available for over forty years and have undergone many improvements in this time. The pigments containing higher percentages of zinc sulphide are more recent developments whereas XX Zinc Sulphide has been commercially available for only a few years.

Zinc sulphide pigments are ordinarily shipped as dry powder in heavy paper sacks. These bags contain 50 pounds, making them very convenient for handling and in estimating the amount of pigment to be added to a process. Barrel packages are also available.

The use of high strength pigments has been increasing among a diversified line of papers. By beater addition, such products as bond, offset, bread wrap and mimeograph are being commercially brightened, whitened and made more opaque. For coating work, fineness, as well as good color, brightness and opacifying properties, has proven of most interest.

In coating work, zinc oxide is also valuable, whereas the basic nature of this pigment makes it difficult to utilize as a beater addition where alum is used as a size. The physical properties of zinc oxide are similar to those of zinc sulphide in having a high refractive index, a bright white color and small particle size.

Motorized Wet-End Drive

Reduces Paper Mill Operating Cost

By R. R. BAKER, Paper Mill Engineer
Westinghouse Electric & Manufacturing Company

Individual motor drive applied to primary and baby presses

INDIVIDUAL motor drive for the wet-end of cylinder machines assures economies in operation and improved and more uniform paper quality. Drives of this type are now in operation in a number of the leading paper board mills of the country and their splendid performance indicates similar possibilities in mills having higher productive costs as a result of the older form of wet-end drive. These mills have reported increased strength with standard machine furnish and equal strength with inferior furnish. One mill reports a reduction in felt cost from $2.10 to 70 cents per ton of board produced and another mill from $2.00 to 60 cents.

With the usual arrangement of cylinder machines the pickup and wet-end felts are subjected to heavy mechanical loads and excessive tension. The felts are threaded between the cylinder moulds and their couch rolls, through various pairs of squeeze, primary and baby press rolls and then through the nip of the first main press, and are required to drag the wet-end sections of the machine. On the more recent designs certain of the primary and baby press rolls have been replaced with extractor or suction rolls, however, each of the moulds and each pair of rolls, whether press, extractor or suction type, requires an appreciable driving effort to overcome the bearing and roll friction.

Wet End Requires Appreciable Power

The practice of driving the wet-end sections through the felt has resulted in short felt life, high felt cost, reduced machine speeds, excessive shrinkage in sheet width, reduced production and inferior qualities in the sheet being formed. Furthermore in meeting the mechanical requirements placed on the felt, it has been necessary to sacrifice in the felt design some of those desirable qualities, which enables it to perform its primary function of sheet formation and water removal.

Numerous tests on various cylinder machines indicate power requirements as follows:

SECTION	*Hp. input to section per inch width per 100 F. P. M.*
Cylinder Moulds	
With anti-friction bearings	.005 - .010
With plain bearings	.0065 - .018
Primary Presses	.010 - .012
Baby Presses	.020 - .025
Suction Rolls	.010 - .015
Extractor Rolls (Estimate)	.010 - .015

As an example of the mechanical load which the wet-end felt is required to transmit, consider a 130-inch—7 cylinder machine equipped with one extractor roll and two suction rolls operated at a maximum speed of 400 F. P. M. Such a machine might require from 35 to 85 hp. depending upon the actual operating conditions. This drag on the felt produces a high felt tension drawing all the strands of the weave tightly together so that the water and dirt cannot be readily removed. Excessive whipping is required, which results in rapid wear and loss of those felt qualities which result in good sheet formation and rapid water removal.

Mechanical Drives Unsuccessful

Attempts to relieve the felts of a portion of the driving load by mechanical drives have never been entirely satisfactory due to their fundamental operating characteristics. Such drives, operating at a fixed speed after final draw adjustments have been made, do not adapt themselves to the changes which occur in felt lengths during the normal operation of the paper machine and by operating at a fixed speed place excess tension in the felt or allow it to run too slack, shortening its life and interfering with the quality and the production of the machine. These mechanical drives have never been very effective and in most cases have been applied to only two or three of the wet-end sections, the balance of the wet-end load being carried entirely by the felt.

Service Record Favors Individual Motor Drive

In 1927 Westinghouse developed and built the first complete sectional electric drive for a cylinder machine having each cylinder mould and primary press of the wet-end section as well as all other main sections driven by individual motor gear units. A separate motor generator set supplied power to all of the section D. C. motors and these motors were operated over the required speed range by armature voltage control. On this particular installation all of the wet-end motors were operated in parallel with the first main press motor and one controller was used to start, stop and accelerate the entire wet-end motor group including the first main press motor. Starting generator control assured gradual and uniform acceleration of the various sections of the machine.

The wet-end section motors were designed with inherent drooping speed-load characteristics to develop the necessary driving effort and yet operate at the exact speed as required by the felt. Slight changes in motor speed which compensate for changes in felt length, take place as a result of the inherent motor characteristics without special speed regulating devices.

Motorized Wet-End Applicable to Lineshaft Drive

Electric drive for the individual sections of the wet-end of a lineshaft driven paper machine, although similar in operating principle, differs somewhat in detail from plants using complete electric sectional drive. The main difference is that with mechanical drive the first main press section is driven from the adjustable speed lineshaft by means of cone pulleys, belt, clutch and reduction gear unit, whereas with sectional drive an adjustable speed motor, under automatic speed regulation with suitable control equipment for receiving power from a main generator, drives this section.

With a lineshaft driven machine, the operation of the wet-end must be synchronized with that of the first main press, both at productive speeds and during starting and stopping of the wet-end and the first main press. The wet-end motors with either type are similar in design and operation. Inherent speed-load characteristics give proper load division and stable parallel operation over the entire speed range.

Several methods are used for syn-

chronizing the first main press and the wet-end sections, the choice depending upon the mill's operating conditions. With sufficient power available in the main lineshaft drive and a limited amount of mill A. C. power, then the power for the wet-end sections can be obtained from a D. C. generator driven from the first main press intake shaft. However, if the mill A. C. power is not limited, a desirable arrangement is to provide a separate motor generator set for the D. C. power supply of the wet-end motors with a pilot exciter driven from the first press section for synchronizing the operation of this section and the wet-end.

First Main Press Drives D. C. Generator

Westinghouse developed and installed a wet-end electric drive having a generator driven from the first press section in 1931. On this installation, the generator is driven from the first press intake shaft on the machine side of the clutch. The generator operates at constant field excitation and generates a voltage proportional to the speed of the press section. The motor equipment on the wet-end is permanently connected to the generator and in order to insure the development of a satisfactory initial starting torque a small A. C. motor driven booster generator is operated in series with the main generator.

Prior to starting the press, when the main generator is at standstill, the booster generator supplies sufficient voltage to circulate approximately full load current through the motor equipment. Upon engagement of the clutch the first press section as well as the connected generator are accelerated. The generator increases in voltage with increased speed and the wet-end motor equipment, with the gradually increased applied voltage, accelerates in conformance with the first main press. The operating voltage of the main generator after acceleration depends upon the final operating speed of the first main press. The generator remains at this voltage until the first press section is stopped or until the operating speed of the machine is changed. This method of drive is suitable for driving any one or all of the wet-end sections.

Driven M-G Set Supplies Direct Current

A second method of operation with lineshaft drive and sufficient A. C. power, consists of a separate A. C. motor driven main generator for supplying power to the individual D. C. motors on the wet-end sections. To synchronize the operation of the wet-end sections with the first main press, a pilot exciter is driven from the first press intake shaft on the machine side of the clutch.

The main generator receives the major portion of its excitation from the pilot exciter and the remainder from a constant voltage source. This generator operates at a voltage as determined by the speed and voltage of the pilot exciter. The excitation which the generator receives from the constant voltage source is such as to circulate approximately full load current through the wet-end motors when the first main press section and pilot generator are at standstill. This arrangement enables the motors to initially develop the required turning effort to insure proper acceleration from zero speed. The pilot exciter operates at all times at a speed corresponding to the speed of the first main press and through its control of the main generator voltage assures synchronous operation of the wet-end motors and the first main press.

Upon engagement of the clutch on the first main press section, this section and the pilot exciter are both accelerated. The pilot exciter increases in voltage with increased speed, thus gradually increasing the excitation and operating voltage of the main generator. The operating voltage of the main generator, as with the other arrangement of drive, depends upon the final operating speed of the first main press. The generator remains at this voltage until the press section is stopped or until the operating speed of the machine is changed.

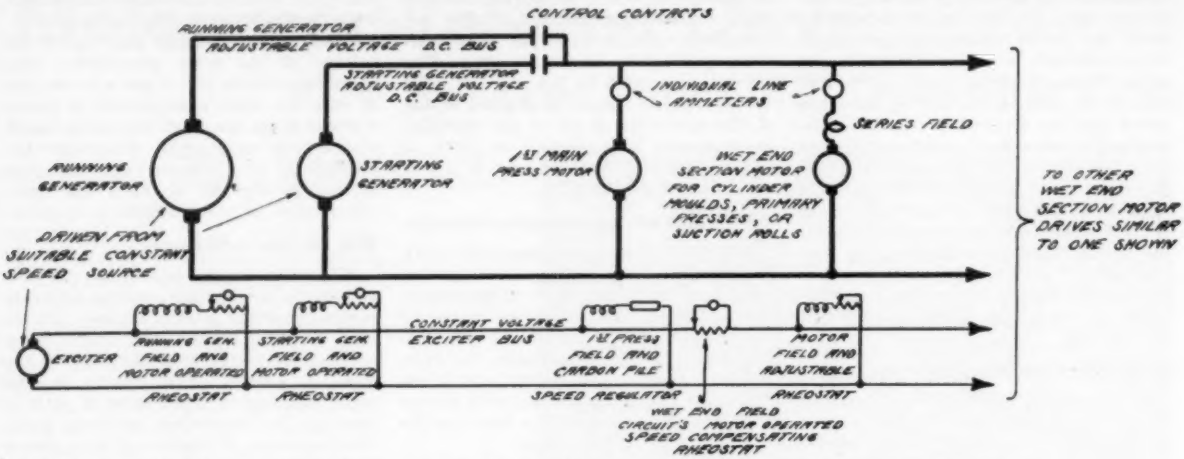
M-G Set Has Advantages

With this design, power for the wet-end drive is provided by the separate motor generator set and the belt, clutch, and gearing, of the first main press section are relieved of the load of the wet-end motors. This results in less wear and tear on these parts or permits the use of somewhat smaller parts. Furthermore, it makes a very much better mechanical layout to eliminate the main generator from the first press section, where it is expensive to install and properly protect. The available space back of the machine is ordinarily at a high premium and to gear or chain the main generator at this point does not improve these conditions. If the main drive is near the limits of its capacity, relieving it of the wet-end load, permits utilizing the capacity made available for higher operating speeds.

Motors Applied to Suit Conditions

With any of the wet-end drive arrangements the motors may be totally enclosed forced ventilated or splash and drip-proof self ventilated. Forced ventilated equipment necessitates the use of a separate blower and ventilating ducts leading to the motors and to the generator when it is driven from the first main press. In certain cases where the installation cost of the ventilating ducts and blower as well as the cost of the

Left—Individual motor drive applied to cylinder moulds. Right—Cylinder paper machine drive in which motor drive was extended to drive primary presses and cylinder moulds


CONTROL CONTACTS
RUNNING GENERATOR ADJUSTABLE VOLTAGE D.C. BUS
STARTING GENERATOR ADJUSTABLE VOLTAGE D.C. BUS
INDIVIDUAL LINE AMMETERS
SERIES FIELD
RUNNING GENERATOR
STARTING GENERATOR
1ST MAIN PRESS MOTOR
WET END SECTION MOTOR FOR CYLINDER MOULDS, PRIMARY PRESSES, OR SUCTION ROLLS
TO OTHER WET END SECTION MOTOR DRIVES SIMILAR TO ONE SHOWN
DRIVEN FROM SUITABLE CONSTANT SPEED SOURCE
EXCITER
RUNNING GEN. FIELD AND MOTOR OPERATED RHEOSTAT
STARTING GEN. FIELD AND MOTOR OPERATED RHEOSTAT
CONSTANT VOLTAGE EXCITER BUS
1ST PRESS FIELD AND CARBON PILE SPEED REGULATOR
MOTOR FIELD AND ADJUSTABLE RHEOSTAT
WET END FIELD CIRCUIT'S MOTOR OPERATED SPEED COMPENSATING RHEOSTAT

Schematic diagram of electrical circuits for individual motor wet end drive as applied to paper machine equipped with complete sectional drive

ventilating ducts are comparatively high, splash and drip-proof motors which afford adequate protection may be installed at a somewhat lower first cost due to the elimination of the ventilating equipment.

Individual Motor Thermostats Lessen Shutdowns

On wet-end drives the motors are equipped with thermostat protection which actuate an alarm system. This arrangement insures complete motor protection against overloads, high ambient temperatures or failure of ventilation and gives the machine operators the opportunity of correcting any condition dangerous to the motor without interrupting paper machine production.

Automatic Circuit Breakers Reduce Production Delays

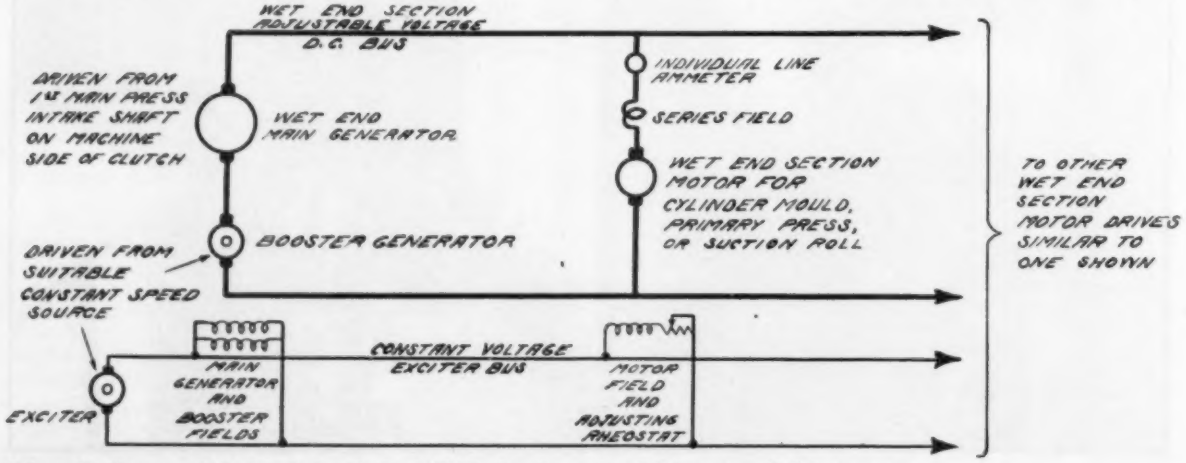
When the wet-end drive is supplied for machines equipped with mechanical lineshaft drive, the generator is connected to the main D. C. bus, and each individual motor is connected to this bus through midget De-ion circuit breakers. These breakers are provided with thermal overload relays and afford automatic no-fuse overload protection for each circuit against excessive overload or short circuit. The breakers on the individual circuits permit readily disconnecting any of the wet-end motors to meet any particular set-up or operating arrangement of the drive. This type of circuit protection eliminates production delays which with the ordinary type of fused disconnect switch results from blown fuses or incorrect fusing.

Operating Stations Concentrate Controls

Each wet-end section motor is provided with an operating station including an ammeter, field rheostat and De-ion circuit breaker, mounted in a short metal cabinet arranged for either individual or group mounting. The rheostat and breaker are totally enclosed and provided with projection handles and the meter is of the flush type. From these operating stations the section power loading may be observed, the draws adjusted or the motor disconnected from the D. C. bus. The operators may closely observe the performance of the machine and make rapid and correct draw adjustments.

From the operator's viewpoint the operator of the wet-end sections when driven by individual D. C. motors is no different than the ordinary arrangement where these sections are driven from the felt. The first main press is started up in the usual manner and the wet-end motors are automatically synchronized without attention by the operator. In adjusting the machine speed no particular attention need be given to the wet-end section motors. As the machine speed is changed over the operating speed range each motor continues to develop substantially constant torque and maintains substantially constant draw between sections due to the inherent speed-load characteristics of these motors.

These individual motor drives together with other modern machine improvements assure maximum quality production at minimum operating cost. The results are demonstrated by equipment of this type in actual operation and the matter merits attention of any mill now using older types of drive.


WET END SECTION ADJUSTABLE VOLTAGE D.C. BUS
DRIVEN FROM 1ST MAIN PRESS INTAKE SHAFT ON MACHINE SIDE OF CLUTCH
WET END MAIN GENERATOR
INDIVIDUAL LINE AMMETER
SERIES FIELD
WET END SECTION MOTOR FOR CYLINDER MOULD, PRIMARY PRESS, OR SUCTION ROLL
TO OTHER WET END SECTION MOTOR DRIVES SIMILAR TO ONE SHOWN
BOOSTER GENERATOR
DRIVEN FROM SUITABLE CONSTANT SPEED SOURCE
CONSTANT VOLTAGE EXCITER BUS
EXCITER
MAIN GENERATOR AND BOOSTER FIELDS
MOTOR FIELD AND ADJUSTING RHEOSTAT

Schematic diagram of electrical circuits for individual motor wet end drive as applied to a paper machine with line shaft drive

The Application of Vacuum Pumps to Paper Machines

By CARLO VICARIO

Manager Pulp and Paper Division
Nash Engineering Company

THE use of vacuum for water removal and felt cleaning on paper machines has steadily increased since the early days of papermaking, and it is the author's purpose to trace briefly this evolution.

On the first machines with relatively long wire, slow speed and free stock, it was possible to obtain a sheet dry enough to be couched through simple gravity drainage and light pressing at the couch roll. It is interesting here to note that one or two fourdrinier paper machines in this country are still operating on special papers without flat boxes or suction couches. With increased speeds and slower stocks, it was necessary to extract water through flat boxes located under the wire by means of vacuum. Without this accelerated water removal, the papers were too wet to stand squeezing at the couch and therefore could not be carried across to the press section of the machine.

Flat boxes were operated satisfactorily connected to hydrostatic drop pipes, more commonly called barometric legs. The latter term gives a rather inaccurate idea of this type of installation since it is possible to operate quite satisfactorily with a drop leg much less than thirty-four feet in length. For successful operation of a drop leg, the stock on the wire must contain a sufficient percentage of water to properly seal the box. In other words, it is not possible to dry the sheet to a point where air infiltration starts without breaking the water column and losing the effect of the leg.

When a positive vacuum pump was applied to flat boxes, it was customary to connect it to the end of a header from which pipes to the individual boxes took off. Each pipe was provided with a valve to allow adjustment of the suction on the corresponding box. The boxes nearer the wet end handled almost entirely water, while the boxes nearer the couch took increasing quantities of air as the sheet became dryer. As speeds increased, more boxes were added and the vacuum pump was called on to handle large quantities of water with the air. Pump sizes were increased until the plunger design then used became very bulky and expensive to maintain. The advent of rotary vacuum pumps did much to overcome these objections as the displacement per unit of space required, was much greater and because the designs were free from many undesirable mechanical features.

It was recognized that the white water was taking up valuable space in the pump—which would otherwise be available for air—and in mills with a basement below the paper machine drop legs again came into use in combination with a vacuum pump for removing the air. Some installations provided a drop leg from the bottom of a tee placed at the end of the header, the air being removed from the top of the tee through a loop running to the pump. Others employed individual legs from each box with an air connection at the top of each, running to a common vacuum manifold. This last arrangement is now quite common practice on high speed news and kraft machines where there are large amounts of water to handle and where a single leg and tee would be cumbersome to install and maintain. Still another method of handling the air and water was developed using a separating tank and a combination air and water pumping unit. The air was removed from the top of the tank and the water from the bottom. The unit consisted of a fan type white water pump and a hydroturbine vacuum pump combined in a common assembly. This tank and pump unit could be installed on the machine floor, eliminating drop legs, seal box and water pump in the basement and delivered the white water to the machine pit or other convenient point.

Owing to the physical differences between a gas and a liquid, it is inefficient to handle both with the same pump. Just as wet vacuum pumps taking gas and liquid mixtures are fast dissappearing in industry, so in paper mills the air and water from flat boxes are being separated before pumping. Small percentages of water, however, such as would be encountered from suction boxes on press felts, can be handled efficiently through vacuum pumps of the common types. It can be stated that an amount of water less than one per cent of the air by volume will not interfere with good pump performance.

This leads us to another consideration. Suction boxes are commonly employed on the felts of cylinder machines, their usual function being to dry the felt before it comes in contact with the paperboard. They are placed beyond the whippers and showers and draw on the top of the felt—that is, the side which receives the paper. A great amount of grit and dirt which remains in the felt after whipping is drawn through to the pump and causes rapid wear, especially in the case of dirty stock. While the quantity of water is less than the one percent above mentioned, still it pays to separate where possible in order to protect the pump. Again in the case of cylinder machines used on strawboard, or other papers, where the water is corrosive because of the nature of the stock, the pump should be protected. Suction boxes which draw on the felt and sheet together do not usually require separation. It is quite common to use drop legs for the boxes on the wet felts connecting the dry boxes directly to the same pump. Piping layouts for accomplishing these results are now fairly well standardized and satisfactory results can always be expected. As air and water travelling at high velocity through a pipe are most thoroughly mixed, the velocity must be reduced to allow the air to leave the water. Many early separation systems were discarded for the reason that pipe sizes were too small for the quantities to be handled and arrangement was such as to cause water to be drawn up with the air instead of dropping out by gravity.

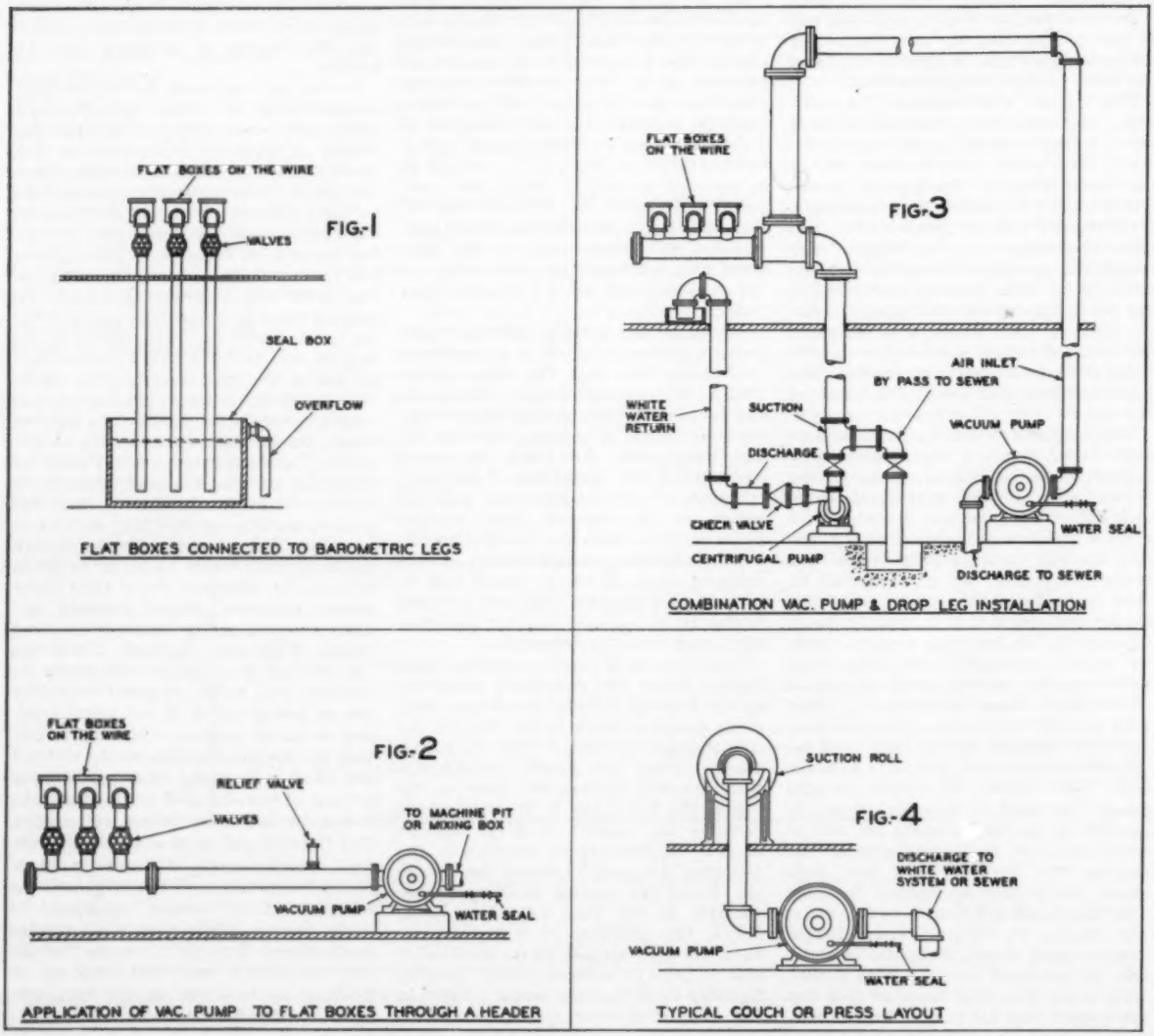
So far, our comments have dealt with suction boxes on wires and felts, and while the water removal through the former is large in proportion to that contained in the stock as it approaches the couch, there is nevertheless a limit to the percentage dryness which can be achieved. By adding boxes and increasing vacuum to keep up with the desire for increased production, the drag on the wire was likewise increased, requiring more power to drive and making for shorter wire life. The advent of the suction roll relieved this situation and permitted the extraction of more water with no added friction. In fact it was usually possible, by installing a suction couch, to decrease the vacuum at the boxes. Common practice today calls for from five to ten inches of vacuum on suction boxes on the wire. Machines without suction couches may require as much as fifteen inches. On the suction couch it is desirable to carry as much vacuum as possible since tests have shown increased water removal and safer running up to about twenty-two inches of mercury vacuum. Naturally, the vacuum is dependent as much on the kind and weight of paper as on the size of pump and it is not sound economy to install vacuum equipment to produce the highest vacuum on the lightest and most open sheet if a considerable portion of the expected production runs to heavier and more "closed up" grades. The lightest and most open sheet, however, determines the minimum pump capacity for satisfactory operation and the selection of the proper equipment is made from a comparison with similar applications. Even so, air capacities per unit of suction area will vary by as much as one hundred per cent for apparently similar installations.

In the case of flat boxes, nearly all of the air withdrawn comes through the paper, assuming deckle stops to be properly adjusted, while with a suction roll a portion of the air is derived from the holes in the roll itself. At slow speeds the effect of the holes is not great but as speed increases it may be an appreciable percentage of the total. This is especially true at high vacuums. In the case of rubber covered suction rolls, the volume of the holes is increased some sixty to seventy-five per cent due to the greater thickness of the shell with its rubber covering. Water removal at a suction couch may be considered as brought about in two ways: first, by infiltration of particles of air knocking off particles of water; and second, by the pressing action of the atmosphere against the paper. A high vacuum increases both of the effects just mentioned. In a suction press the function of vacuum is to remove the water which collects in front of the nip due to the pressing action of the top roll. Centrifugal force, of course, opposes the inward flow of water and the vacuum must be sufficient to overcome this and produce a flow toward the box. Especially in high speed machines only a small amount of the water removed by the press ever reaches the box inside the roll. It is held in the holes and thrown out by centrifugal force after passing the nip. In the case of rubber covered suction presses this is even more noticeable since the length of the holes, which the water must traverse, is greater, while the time during which any hole is over the box is the same. It has been found that best operation for suction presses is obtained with from eighteen to twenty inch vacuum although on slower machines fifteen-inch vacuum seems sufficient.

With the suction couch, the sheet of paper itself is the only obstacle in the path of the air and therefore, as we should expect, vacuum requirements vary widely with different papers. With the press, the felt and to some extent the top roll obstruct the flow of air and the sheet itself merely helps to seal the felt over the box. Air requirements for suction presses are, therefore, less dependent on the kind and weight of paper. On machines using top and bottom felts, the paper has still less effect on air leakage. Suction rolls, especially presses, are finding more and more applications in the board industry and the air removal required for them is quite small. The seal consisting usually of two felts and the paperboard, is very tight and a high vacuum can be secured with a relatively small pump and correspondingly low power consumption.

The foregoing discussion brings out the fact that flat boxes on wires and felts require relatively small vacuum pumps because the former are sealed with wet stock and the latter by a wet felt. Suction couches take large pumps both because of the high leakage through the sheet on most papers and because this leakage is greatly expanded at the high vacuums usually carried. Suction presses require smaller pumps than couches because of the better seal due to top roll and felt.

Some average figures for the volume of air handled by vacuum pumps on paper machines on various types of paper may be of interest. The volume shown is the total for all vacuum pumps and is given per inch of wire or felt width for



average speeds of paper machines.

	F.P.M.	C.F.M. per inch wire width
News	1000	40.0
Kraft	800	35.0
Book	600	22.50
Bond	350	14.7
Glassine	500	15.1
Tissue	700	19.3
		C.F.M. per inch felt width
Chip Board... (no suction rolls)	250	5.6
Test Liner... (suction presses)	300	12.7

It should be noted that figures on individual machines from which the above averages were compiled vary through wide limits. Some of the machines considered are equipped with couch and two suction presses while others may have only one suction roll. This leads us to a consideration of the economic limit of vacuum extraction of water. Considering the fourdrinier machines, it will be seen that the volume of air removed varies quite closely with probable tonnage production. There appears to be a discrepancy in the case of tissue and this may be explained by the delicate nature of this paper, requiring a greater degree of mechanical drying before it can be safely run to the steam dryer. As far as we know, it is impossible to calculate definitely the point at which mechanical removal of water ceases to pay. This will depend on the relative costs of steam and power at a given mill, on the efficiency of vacuum pumps, and on the increasing cost of drying by vacuum and pressing as the sheet becomes dryer. This last follows the law of diminishing returns but is to some extent dependent on the nature of the paper. Since vacuum pump efficiency has been improved considerably in recent years, and since the cost of power generation is also much less, the range of economic vacuum drying has been extended.

This article has dealt only with the relative costs of removing water by vacuum and pressing, as against the costs of evaporating the water in the dryer. Actually, the addition of suction press rolls has a marked effect on the quality of the paper produced, on felt life, and on the safe running of the machine. The maintenance of a high vacuum on each roll insures its best performance. These matters are really beyond the scope of this article but it should be borne in mind that they often far outweigh the question of relative drying costs.

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◆ THE TIMKEN Roller Bearing Company, Canton, Ohio, announces that H. H. Timken has resigned from the presidency of the company and Wm. E. Umstattd has been elected as president. Mr. Timken remains as chairman of the board. Henry H. Timken, Jr., has been elected vice president of The Timken Roller Bearing Company and a vice president of The Timken Steel & Tube Company.

Superheated Steam
In The Paper Industry

By N. T. PEF, Consulting Engineer

THERE are many power plants in the paper industry erected at a time when full advantage of superheated steam was not realized that can reduce their fuel bills through its use. In round numbers and for average conditions, the fuel bill may be reduced 10 per cent and the capacity increased 15 per cent for each 100 degrees of superheat. These figures are for plants generating their own power.

From 15 to 50 per cent of unsuperheated steam, in the case of the engine, condenses on entering the cylinder and before it has done any work. Assuming a cutoff of 30 per cent and average conditions, the initial condensation is 20 per cent, which means about 200 B. t. u. lost per pound of steam. On the other hand, if the steam is superheated, the reduction in superheat will be about 150 degrees for 30 per cent cutoff, the loss being 85 B. t. u. per pound of steam. The loss in percentage, therefore, is 17 per cent for saturated steam and 7 per cent for superheated steam or a net gain with superheated steam of 10 per cent on the score of initial condensation alone.

One of the most serious problems in connection with turbine operation on the other hand is the destruction of blades. Replacing blades costs money and the fact that the machine must be taken out of service might be more important than the cost of new blades. The destruction of the blades is caused by the erosive and corrosive action of the moisture in the steam which can only be reduced or prevented through the use of superheated steam.

If the steam is not superheated, in the case of the turbine, part of it will condense on entering the unit and the condensation will grow as the steam flows toward the turbine outlet. The water of condensation in the form of small drops acts as a brake slowing down the turbine wheel and reducing efficiency.

It appears that superheated steam has been used for the past 100 years, but it has been only during the last quarter of a century that it has come into general application. Its wider application was delayed not so much by lack of appreciation of its advantages but because of failure to solve the mechanical problems in connection with its use. One of these problems was the question of lubrication, which has been solved through the substitution of mineral oils that will withstand the high temperature. In addition, fibrous packings have been replaced with metallic packings and special metals have been developed that will withstand any steam temperature up to 1000 degrees.

The use of highly superheated steam, over 150 degrees superheat, will not be practical in a plant that was originally designed for saturated steam. Any plant now using saturated steam, however, can change over to superheated steam up to 100 degrees with possibly no other changes than switching to a different cylinder oil. Through such a change the capacity of the plant may be increased about 15 per cent and the coal reduced about 10 per cent.

In addition to the figures just mentioned which are for the turbine or engine room alone, there is a gain both in efficiency and capacity in the boiler room. The construction of practically all boilers is such that there is necessarily empty space within the setting which makes possible the insertion of superheating surface without in any way changing the setting. For purposes of estimation, the increase in efficiency may be taken as 2 per cent and 5 per cent increase in capacity, for each 100 degrees superheat.

The two principal reasons for increase in efficiency through the use of superheat in connection with the engine and turbine are the elimination of initial condensation of the engine and reduction of the brake-effect of the condensation in the turbine. Another reason for higher efficiency is due to the fact that superheated steam holds heat better than saturated steam. In other words, its heat of conductivity is lower. Therefore, if steam is to be transmitted over long distances, losses can be reduced with superheated steam. Since higher velocities are permissible with superheated steam, the use of smaller size pipe will be an additional gain, and at the same time fewer traps are needed.

As it has been indicated, superheated steam increases the capacity to a greater extent than the reduction in the fuel cost. What the increase in capacity may mean under certain conditions will be appreciated by an examination of a hypothetical case. A 1000 kw. plant, due to natural growth, is short in meeting the power and steam demands to the extent of 20 per cent. This deficiency means the installation of 20 per cent additional capacity in boilers, piping, pumps, engines or turbines, condensers, etc. The total additional investment needed for such an installation assuming $300 per kw. will be $60,000 while the same increase capacity can be had through the installation of a superheater at about one-tenth of this amount. At the same time, the superheated steam will increase automatically, the capacity of the piping, turbines or engines, condensers, pumps, etc., and also will reduce fuel bills through higher efficiency.

Superintendents Hold Profitable Annual Meeting

Fifteenth Convention at Poland Spring, Maine featured by instructive program and delightful entertainment

REAL New England hospitality with the latch strings out or the doors wide open was manifested throughout the entire proceedings of the fifteenth annual convention of the American Pulp and Paper Mill Superintendents Association. The place of the meeting was certainly conducive to this feeling of friendliness for it was in a region where mountains, forests, lakes and sky mingle with one another in close harmony to produce a vista that is both exquisite and restful. Into this scene of natural beauty the Poland Spring House, headquarters for the convention, supported as it were upon a carpet of velvety green turf, took its position as if by some occult means.

It should be pointed out that this convention was the first national gathering of the association to be held within the State of Maine. The days of the meetings included June 20, 21 and 22, 1934.

Activities of the First Day

The program of the first day was given over entirely to sports and entertainment. The problems of business, for the time being at least, were left behind and play and frivolity took the lead.

During the morning, those who desired played a round of golf; bowled on the velvety green lawn; fished; or sought entertainment of their own making. At noontime, when all were at luncheon, Neal O'Hara, newspaper columnist and humorist, introduced by W. E. Parsons of Keyes Fibre Company as toastmaster, read a number of fictitious telegrams from various notables that brought a number of good laughs, and otherwise entertained the convention delegates with his wit and humor.

The formal program of the afternoon, following the luncheon, was given over to the golf tournament, a feature which each year brings forth some promising material of championship caliber.

At the sport jamboree dinner that evening, Clyde W. Stewart of the Parker-Young Co., acted as toastmaster. Some of the indoor sports which followed included a boxing exhibition by two lightweights, who went at it in earnest. One of them was knocked out in the third round. Then there was a tug-of-war by eight superintendents and eight so-called peddlers. Since it was all in fun the superintendents won, but before doing so, it was necessary for reinforcements to be added to their end of the rope.

Following the tug-of-war, there were several extremely interesting and humorous indoor rowing matches after which Joe Dow of Castle & Overton, Inc., announced the winners of the various golf meets of the day.

Larry Grey, "The Dizzy Wizard," then amused the audience with a number of cleverly presented card tricks and personal characterizations of several radio stars. John Nolan, of the International Paper Co., Niagara Falls, N. Y., and Eugene Bechard, of the Eastwood-Nealley Corporation, completed the round of entertainment with individual stunts of their own.

Second Day's Program Most Diversified

On the morning of June 21, the second day of the convention, K. E. Terry of the S. D. Warren Co., and General Chairman of the Convention Committee, called the convention to order in the Music Hall of the Poland Spring House. He said that it was now time to turn from the frivolous to the more serious and business-like side of the convention and expressed the hope for his committee that the program of papers would furnish a wealth of diversified interest and at the same time be full of subject matter.

Mr. Terry then turned the meeting over to Herbert Randall of the Champion Coated Paper Co. and President of the Association, who called upon Rev. Harry E. Townsend, D. D., to give the invocation. Following the invocation, Robert Eminger, Secretary of the Association, read the names of those members who since the last annual meeting had passed on. This list included the names of Thomas F. Dillon, W. T. Kilgore, A. D. Nadeau, Walter L. Potts, Wesley N. Tilton, Lee L. Wilson and Lyman Derby Post. Following the reading of these names, the Rev. Townsend delivered the "In Memoriam."

The address of welcome was next presented by Rodger L. Gowell of Poland, Me. Mr. Gowell mentioned that nature had been very lavish to the people of his State. He suggested that mountain and sea and lake all come together at Camden; and that in the Moosehead and Rangeley Lake regions one could find rest and recuperation. He told of the industrial position of the State; and mentioned its natural resources, as well as its educational facilities. Several noted men of the state, among whom was Henry W. Longfellow, were listed. In concluding his remarks, Mr. Gowell said that the most important thing in life is the mingling of folks with folks, and he invited all in attendance to linger as long as they could this time and to come again as early as they could.

Response to Mr. Gowell's remarks in behalf of the Association were made by Charles Champion of the Millers Falls Paper Co. and Second Vice President of the Association.

Mr. Randall then read his message as President of the Association. He mentioned briefly the place of the Association in relation to the Paper Code Authority; stated that forty-five new members had been enrolled from May 1 of last year up to the writing of his message; commented on Association dues and membership service; told of an increase of approximately 20 per cent in the amount of advertising in the Year Book this year over that of last year; and, in conclusion extended his appreciation to the staff of their official organ, *The Paper Mill and Wood Pulp News*, and to the other trade journals serving the industry for their part of the activities of the Association.

After the appointment of a nominating, resolution and an auditing committee, Mr. Randall called upon Dr. Charles H. Herty, Director, Pulp and Paper Laboratory, Savannah, Ga., to present a paper on *Newsprint from Southern Pine*.

Dr. Herty at the outset of his remarks told of the great deal of publicity that has been given the work of the laboratory and suggested that much of it has not been true. One of the misconceptions, said Dr. Herty, is that many think that pine in the South means yellow pine. In displaying samples of the wood being pulped it was pointed out that the heart of the pine is yellowish; and that the logs when peeled are white in color, although reddish in cross-section. The reddish appearance was said to be due to the very dense formation of summerwood. A chart was used to illustrate the difference between this portion of the wood from that of the springwood.

Dr. Herty in contrasting the pine with spruce, said that the pine had two kinds of wood in one log, and that the problem in cooking and in grinding it was to learn how to handle these two kinds of wood. Color itself was said to have no consideration in the case; that groundwood produced from sapwood of the pine was whiter than that of spruce as was the case with unbleached sulphite.

He emphasized the fact that the pine tree is not a storehouse of resin but is rather a producer. As the pine tree grows reaching an age of about twenty-five years, the contents of the cells were said to change completely; that the cells become inactive and thus they constitute the heart of the pine. The flow of resin from the pine was then said to come from the sapwood rather than from the heartwood.

Dr. Herty then told of an inquiry made to ascertain the opinion of individuals familiar with pine as to the percentage of resin in unwounded pine of

approximately twenty years old. This inquiry showed a wide variance in figures, so thirty trees in this age class were selected, cut, peeled, sawed, sawdust sampled and tests made for resin. The tests indicated a resin content of about 1¼ per cent. Confirmation of these results was also obtained from outside agencies. It was then pointed out that the flow of resin is a pathological phenomenon.

In commenting further upon the research activities of the laboratory, Dr. Herty said that no trouble was experienced with pitch over a period of two years; then a change in wood developed pitch trouble which was again eliminated by changing the cooking procedure. Insufficient time was said to have been given for penetration in the pulping experiments which gave trouble from pitch. Pitch, however, was said to have nothing to do with the resin content of the pine. A satisfactory cooking acid for pulping the pine was given as 1.2 combined and a total of 5 to 5.5 per cent. The cook suggested was twelve hours.

It was learned early in the investigation of the grinding characteristics of the pine that it couldn't be treated like spruce. If it were handled in that manner, the result resembled flour. By raising the cylinder pressure to 90, 95 and even 100 pounds good pulp was said to be made.

Recently logs not less than forty years of age with 10 per cent heartwood by volume and 20 to 30 per cent by weight were ground and no resin was noticed on the stone or in the pulp after three or four hours of grinding. Wood with 25 per cent blue stain was also ground, and the resultant groundwood was stated to be the lightest colored groundwood the laboratory has yet produced. Sulphite produced from similar wood, however, was filled with black spots wherever a fungous was present.

Samples of groundwood, sulphite, newsprint and of a 100 per cent groundwood sheet were displayed; and then mention was made of work on alpha cellulose that has been started. The alpha cellulose content was found to be satisfactory, although as yet the ash is a little too high probably due, as suggested, to a bleaching of the stock with a calcium base liquor.

In concluding his remarks, Dr. Herty estimated that there are 99,000,000 acres of cut-over land in the South made up of 57,000,000 acres of wood lots, 25,000,000 acres of abandoned farms, and 17,000,000 acres thrown out from the raising of cotton. A yield growth of two cords of wood per acre per year was given as a possibility, as was the fact that a 100-ton sulphite mill might be made to operate into perpetuity in the proper location in the South without a wood haul of over five miles.

Dr. Herty's presentation, which was most enthusiastically received, was followed by a paper by Morris S. Kantrowitz, Technical Director, U. S. Government Printing Office, on *Government Printing Office Paper Tests and their Significance.*

Mr. Kantrowitz stated that the Government Printing Office purchases annually on technical specifications approximately fifty million pounds of paper ranging from newsprint to the highest grade bond, ledger and index; that one of the most important duties of the Division of Test and Technical Control is the testing of the deliveries of paper for compliance with the specifications drafted by a committee designated by the Congressional Joint Committee on Printing; and that the testing of paper at the Government Printing Office consists of two parts—technical testing covering microscopical, physical and chemical requirements; and visual examination for comparison with standard samples which show the desired characteristics of color, finish, formation and cleanliness.

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A compound microscope giving a magnification of 60 diameters and fitted with a mechanical stage was said to be used for making microscopical analyses. Such a microscope is also fitted with projection equipment to throw the image of the fibers downward upon a horizontal screen and thus avoids eyestrain.

Since certain physical tests, especially folding endurance, are considerably affected by variations in relative humidity, they are conducted under standard paper testing conditions of 70 to 75 deg. Fahr. and 50 per cent relative humidity.

The physical qualities, pointed out by Mr. Kantrowitz, included in the Government specifications for paper are weight, folding endurance, bursting strength, tensile strength, thickness, opacity, ink absorption, color, finish, formation and cleanliness. Weight determinations were said to be made on all deliveries of paper for the basis of cost and if a delivery is found to be more than 5 per cent above or below the ordered 1,000-sheet or other unit it is rejected. The folding endurance test was stated to be most valuable for papers which are required to undergo considerable creasing and folding in use.

It was also pointed out that bursting strength determinations are made on all papers with the exception of newsprint, gummed paper and railroad board; that tensile strength determinations are made only on newsprint; that thickness is an important factor of certain papers, as book papers of the same weight, for example, must possess uniform thickness in order that volumes of a set of books will possess equal bulk; that opacity is one of the most important properties of printing paper and that opacity measurements by the contrast ratio method are made on newsprint, book and mimeograph papers; and that the ink absorption test indicating the serviceability of blotting paper is made by the pipette method in which the time required to absorb one cubic centimeter of standard writing ink is noted.

Since no standard test methods for determining the color, finish, formation and cleanliness of paper has been adopted by the Technical Association of the Pulp and Paper Industry, Mr. Kantrowitz said that prospective bidders are, therefore, supplied with standard samples, showing these characteristics and deliveries must conform to these standards as determined by visual examination.

In concluding his remarks on the physical tests of paper, he mentioned the Bekk tester for measuring the smoothness of the surface of paper in numerical terms; and the finish, formation and porosity tester of Frank M. Williams. Then he proceeded to discuss the chemical tests which were said to determine the permanence of paper. These tests included ash, moisture, rosin and acidity determinations.

Moisture content was said to be determined in posta! card bristol only; that rosin size determinations are made on all bond, ledger and index papers and on other miscellaneous papers, such as map, chart and manifold papers, intended for permanent or semi-permanent use; and that the acidity requirements in Government specifications are expressed as pH values. Full details of the method for making the pH determination were said might be obtained from the Division of Tests and Technical Control of the Government Printing Office.

The reading of Mr. Kantrowitz's paper and the discussion which followed it completed the morning session.

At the noonday luncheon of the second day's program, T. F. Spear, Mill Manager of the Oxford Paper Co., acted as toastmaster and Rev. John Nicol Mark as guest speaker. The subject of the Rev. Mark's talk was given as "Scotch Wit and a Little Philosophy." After telling most cleverly a number of Irish and Scotch stories he repeated one of Henry Van Dyke's well-known poems. Then very briefly he recommended that each individual think through his own head; laid stress on the fact that he lives most who thinks most; and suggested that the real problem of the day was one of world fellowship and world brotherhood.

The afternoon of the second day, following the luncheon, was given over to

six group meetings, namely: Soda and Sulphate, Sulphite, Groundwood, Tissue, Board and Book and Fine Papers.

Soda and Sulphate Group Meeting

Two papers were scheduled for presentation before the Soda and Sulphate Group meeting with B. D. Millidge, of Howard Smith Paper Mills, as Chairman. One of these papers covered *The Art of Bleaching in Theory and in Practice* and was presented by C. T. Henderson of the Westvaco Chlorine Products Corp.

In Mr. Henderson's paper it was pointed out that pre-treatment of stock with chlorine consists in forming chlorine compounds with the lignins and coloring matter, which compounds are water soluble and, therefore, removable by washing. It was also stated that experience has shown that, up to a certain point, more color can be removed per pound of chlorine employed where the chlorine is used as such rather than as a releaser of oxygen; and that less damage is done the pulp by pre-treatment than by the bleaching it replaces.

The addition of chlorine to the stock, however, was said to result in an acid condition which must be neutralized before washing in order to protect the washer and to make the chlorine reaction products more soluble. In addition, the acidity developed was stated to degenerate the pulp, particularly kraft, the stock in many instances being completely ruined by such exposure.

Mr. Henderson told of work that he has done in studying a pre-treatment process in which the chlorine was used as hypochlorous acid rather than as chlorine in water; and explained, that although it has been contended repeatedly that pre-treatment with chlorine water or by direct chlorination are exactly the same as pre-treatment with hypochlorous acid, that such is not the case. The chlorine in hypochlorous acid, in the usual sense, was said to be far less active than when it occurs as free chlorine. It was further pointed out, however, that the reaction of lignins with chlorine in aqueous solution is not a straightforward one; that lignin must be considered as it is left after digestion; and that if chlorine is added to water in the presence of calcium carbonate (marble, limestone, oyster shell, etc.), that the reaction continues until all the reactive chlorine present appears as hypochlorous acid without the necessity of using extreme dilutions. At the same time, it was said, the hydrochloric acid formed is neutralized, appearing in the solution as calcium chloride; and that a solution obtained in this fashion contains hydrochlorous acid alone as active component, free chlorine being entirely absent.

It was further explained that, although the complete removal of lignins from cellulose by means of chlorine or of hypochlorous acid is possible in the laboratory, it is not feasible in practical pulp mill operation. In practice, preliminary solubilizing and removal of the majority of the lignins is followed by removal of the balance through oxidation of the bleach liquor. The lignins remaining attached to the cellulose after the first stage of bleaching were said to have had chlorine added to their structure and are more susceptible to attack by bleach liquor (an oxidizing reagent) than is unchlorinated lignin.

It was again emphasized that the chlorinated, solubilized lignins, developed during the first stage bleaching which go into solution in water in which the pulp is suspended, must be removed before an oxidizing reagent is applied. Otherwise, the oxidizing agent will first expend itself by reaction with those dissolved chlorinated lignins before it attacks the residual, less reactive lignins which remain attached to the fibre.

Before filtration and washing is attempted, the acidity which develops during the first stage treatment of pulp with a free chlorine reagent should be neutralized with an alkali. Sometimes this addition is made before all the chlorine added in the first stage has expounded itself thus converting any remaining free chlorine to bleach liquor. This liquor expends itself in oxidizing the chlorinated lignins which have already been removed from the fibre by solution in the water present, and in the event that a large excess of chlorine has been added in the first stage, may also oxidize the chlor-lignins remaining on the fibre—the chlorine consumption in such a case remaining substantially the same as that required for a single stage bleach with bleach liquor.

The second paper scheduled before the Soda and Sulphate Group meeting was a jointly prepared paper by B. D. Millidge and E. Taylor of the Howard Smith Paper Mills, Ltd., and A. A. Heimrod of the Western Precipitation Company on *Recovery of Soda from Spent Liquor*. In this paper was described the equipment installed in the recovery plant of the Howard Smith Paper Mills and information given as to the efficiency of operation. It was stated that the mill with an output of approximately 50 to 55 tons of soda pulp per twenty-four hours is equipped with three modified Wagner furnaces, each having an overall dimension of 18 ft. 0 in. in height by 10 ft. 0 in. in diameter under the roof and tapered at the crucible to a diameter of 8 ft. 6 in. with a crucible depth of 7 ft. 0 in. The strength of the black liquor was said to vary from 30 to 36 deg. Beaumé measured at 60 deg. Fahr.; that at normal concentration, 35 deg. Beaumé, one cubic foot of the liquor weighs 81 pounds and consists of 55 per cent solids equivalent to 42 pounds. The black liquor is sprayed into the furnaces (two being continuously in operation) at a pressure of 20 pounds per square inch. In this operation the organic matter in the liquor is burned off and the reaction of the soda now in gaseous form and at an elevated temperature combines with the necessary carbon and oxygen so that the molten product which is tapped continuously from the furnace crucibles is relatively pure sodium carbonate. The heat of reaction is said to be such that a gas temperature of 1,700 deg. Fahr. is produced in the upper zone of each furnace where a single row of water tubes is installed as an integral part of the roof structure to protect it and to fur-

Picture taken during the Fifteenth Annual Convention of the

nish hot feed water to the waste heat boilers. The gases leaving the furnaces are passed through water tube boilers and are thereby cooled to a temperature of 450 deg. Fahr. The heat recovery at this point is said to average 7,500 pounds of steam per ton of pulp produced.

In order to condition the gases for further treatment for the collection of the entrained sodium carbonate and reduce the gas temperature, a gas scrubber was installed. This scrubber consists of a steel tank 10 ft. in diameter by 30 ft. high, the top plate having been drilled with ¼-in. holes equally spaced 3 in. center to center. A ring 1 ft. high welded onto the outer circumference of the top plate was said to assure sufficient water depth for the maintenance of a 6-in. head over the surface with a continuous circulation of cooling water. In the scrubbing system, the gas temperature is reduced to approximately 170 deg. Fahr. by scrubbing, cooling and saturating the gas with water vapor. The saturated gas from the scrubber has a total volume of 24,200 cubic feet per minute at 170 deg. Fahr. and at this temperature is said to be in proper condition to be further treated in a Cottrell Electrical Precipitation system.

The Cottrell installation, directly following the scrubbing system, is composed of three separate units in parallel to each other. The units are constructed of steel, each tank being 10 ft. in diameter by 20 ft. high with two insulator compartments attached to each unit for the proper support of the high tension discharge frames. Each unit has a top header plate to support the upper ends of the collecting tubes—74 8-in. diameter by 12-ft. long steel tubes or a total of 222 tubes for the entire installation of three units. Hung taut from the discharge frame over each collecting tube is a discharge electrode of ⅛-in. square twisted steel rod. Each electrode is centered axially with the collecting tube and held rigidly in place by means of a spacer frame.

The total gas volume, distributed among 222 pipes, allows the gas to be treated at a velocity of 5 ft. per second through the ionizing zone. The gas volume per tube under these conditions, therefore, is 110 cubic feet per minute.

The gas entering the precipitator was said to carry in suspension 0.09 + grams of sodium carbonate per cubic foot; and that repeated tests have indicated an average concentration of 0.006 grams per cubic foot in the exit gases or an over-all collection efficiency of 90 per cent of the sodium carbonate.

Details of energizing equipment were given, the entire regulation being said to be centered at a single switchboard.

The amount of collection in the installation requires cleaning by water flushing every two hours, the flushing water from the units being run into a common wash water solution tank together at intervals with the scrubbing from the gas scrubber. The scrubbing water is drawn off whenever make-up water is required for a secondary Dorr thickener in the causticizing plant.

The remaining operations in the liquor cycle were briefly described and in conclusion it was stated that the over-all efficiency of the soda recovery plant on a monthly basis is 93 per cent.

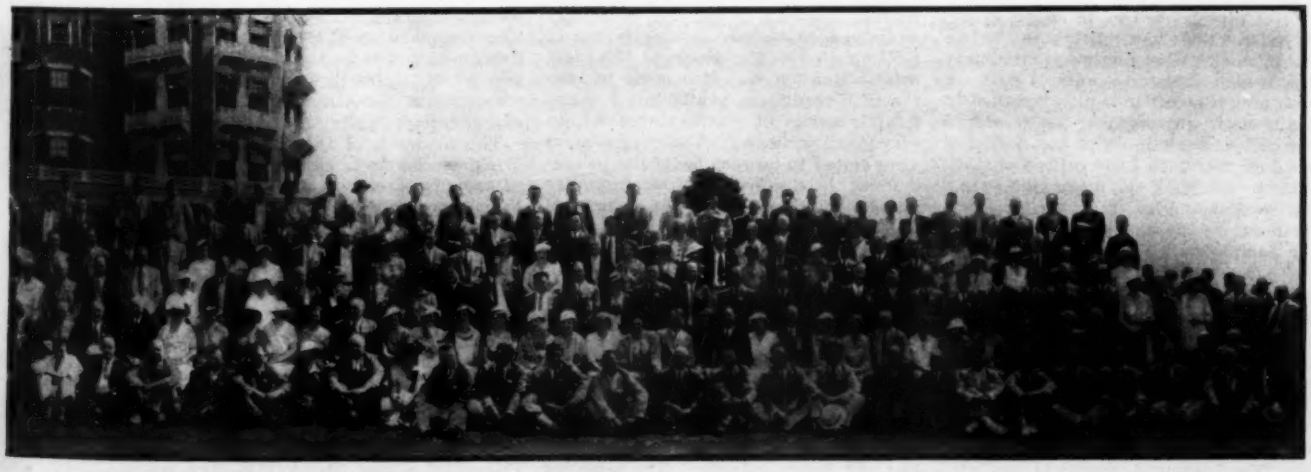
In the program of this Soda and Sulphate Group meeting was included a discussion on recovery problems.

Sulphite Pulp Group Papers

Three papers were scheduled for presentation before the Sulphite Pulp Group meeting over which Vance P. Edwardes of the International Paper Co. presided as Chairman. The first of these papers, *The Art of Bleaching in Theory and Practice*, by C. T. Henderson, has already been mentioned in the papers presented before the soda and sulphate group meeting which was read in conjunction with this group. The remaining two papers included one by John Frank Garrigan of the International Paper Co. on *Wood Room Operation*, and the second by R. K. Lear, also of the International Paper Co. on *Measurment of Sulphite Production by the Use of Flow Meters*.

In Mr. Garrigan's paper emphasis was placed upon improved operating conditions brought about by a detailed study of various factors on the production of sawdust and through the use of a chip filling device. By knowing the amount of wood going to the chippers and the sawdust produced, it was pointed out, the amount of sawdust being produced during a full day's operation could be easily determined. Therefore, an automatic device to measure and record the quantity of sawdust rejected from the screen was installed between the screen and refuse conveyor. Information received from this installation has caused the chippers to be slowed down from 285 r.p.m. to 185 r.p.m. to decrease the volume of sawdust produced by them. Then a study of chipper knife conditions showed that the percentage of sawdust loss increased as the knives became dull and the fact that the knives were filed at 10:00 a. m. and 3:00 p. m. did not greatly reduce or slow up the increase in sawdust loss. It was then proven that by changing knives at 10:00 a. m. and 3:00 p. m. instead of filing them that there was a very decided decrease in the amount of sawdust produced. The extra grinding of the chipper knives necessitated by more frequent grinding was said not to decrease the life of the knives to any great extent and that the loss in time caused by more frequent changing was more than compensated by the reduction in sawdust. Tests also showed that chips passed through a pin type of chip breaker were larger and more uniform in size than if passed through a swing hammer crusher; and at the same time that the amount of sawdust produced was reduced approximately 50 per cent through the use of the pin type breaker.

A chip packer which can be run on a track on the floor in the digester house or suspended from an overhead head trolley, was described and some of the precautions to be heeded in its use suggested. The use of the device, on the other hand, was said to give an increase in digester capacity of 20 to 22 per cent; lime in acid had to be increased approximately 16 per cent; steam savings were



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almost in direct proportion to the extra yield; sulphur requirements were reduced 10 per cent; and the pulp slightly increased in chlorine number with an approximate 5 per cent increase in strength.

Mr. Lear in his paper on "The Measurement of Sulphite Production" told of the long felt need for quick and accurate means of determining either the production per digester for yield calculations or the total production per day in order to calculate the actual per cent of sulphite in the finished paper. It has now been definitely proven, said Mr. Lear, that a meter can be made to record the value of stock to within plus or minus 1 per cent. Such a meter was stated to be manufactured by R. W. Sparling of Los Angeles, Cal.

It was pointed out that the installation of meters in stock and white water pipe lines presents an entirely different problem than that encountered when working with clear water; that it was found necessary, because of slime difficulties, to install each meter in a suction of seamless drawn copper tubing with at least eight pipe diameters of straight approach to the meters; and that a rough surface causes a much higher deposit of slime than a smooth finished surface, and a meter propeller blade of a brass composition apparently does not slime over as quickly as an aluminum alloy blade. It was also found necessary to keep the air out of the pipe line at the location of the meter and in several installations to install straightening vanes to prevent a swirling action in the flow. The problem of calibrating meters in such surface and methods employed were described.

Considerable experimental work was said to have been done to develop a means for obtaining an accurate consistency sample of sulphite slush stock at one-half of 1 per cent. A sampling system as finally developed for this purpose was described. In brief, a portion of the flow to be sampled is drawn off through an inch and a half or two inch pipe line at a point of violent agitation. This pipe line terminates at an elbow and a vertical section of pipe a foot and a half to two feet long; the vertical section of pipe being free to swing on the threads of the elbow. Below the swinging pipe is another section of stationary pipe which leads to a sample pail. A metrograph recorder is also installed in conjunction with a meter for recording the gallons per minute at any period of the day. For each 2,000 gallons of stock that pass through the meter, the swinging section of pipe is drawn back and forth across the opening of the pipe to the sample pail and samples collected and ten consistencies taken at the end of each shift or a total of 30 consistency samples per day.

An automatic chip sampling device was also devised to select representative samples of chips for moisture determination, and a chip Weightometer installed in the wood room. Combining these instruments as a unit with the meter system, Mr. Lear said, means is available for determining the production and the yield on a slush stock system without interrupting the routine and practical operation of the sulphite mill so that experimental and research work can now be carried on under conditions of commercial operation.

Groundwood Group Meeting

Wm. H. Brydges presided as Chairman over the groundwood group meeting and before this meeting were scheduled two papers and a round table discussion. One of the papers was presented by A. W. Simpson of the Canadian International Paper Co., and the second paper on the schedule was by A. E. Fuller of the Gilman Paper Company.

The subject of Mr. Gilman's paper was *Groundwood Pulp for High Speed Newsprint.* High speed news was taken to include that manufactured at above 1,200 feet per minute. Much of the news made on machines operating at high speed were said to contain in the vicinity of 25 per cent sulphite, while some machines at 1,200 feet per minute are using as low as 16 per cent sulphite.

According to Mr. Simpson a machine running above 1,200 feet per minute will require a headbox freeness from 60 to 70 (Can. Std.) which, with the ordinary use of fan pump water, corresponds to a mixed stock freeness of about 150 to 160 (Can. Std.). Using 20 per cent sulphite, said Mr. Simpson, it will be necessary to use a groundwood testing about 90 to 100 (Can. Std.) after it is put through the consistency regulator.

In the final analysis groundwood pulp for high speed news was stated to be made at the stones, it being believed that the highest strength for any given freeness can only be obtained by grinding a long fine fibered stock containing a minimum of coarse fibres or bundles, and the right quantity of fine or white water fibre. It was further stated that all mechanical equipment, to produce this type of groundwood, must be in A-1 shape and then the factors finally responsible for the type of pulp produced were discussed. They included burr cut and lead, pressure or power per unit area of stone face, and consistency and temperature of stone pit. A stone pit consistency, measured at the dam boards, of 3.5 to 4.5 per cent B. D. was recommended as was a temperature of 150 deg. to 160 deg. Fahr. at the same point. Mention was also made to temperature regulators available for maintaining stone pit temperatures within very narrow limits. These regulators were stated to be very beneficial in controlling the uniformity of stock quality and in lengthening the life of natural pulpstones.

Tissue Group Activities

The papers scheduled before the tissue group meeting with H. H. Harrison of Crystal Tissue Co. as Chairman included one by Benjamin E. Teale of E. D. Jones & Son on the *Teale Slice for Tissue Paper*, and another by Richard F. Hawkins of Minneapolis-Honeywell Regulator Co. on *Automatic Controls and the Paper Industry.* The schedule also included a general discussion of drying and other important problems.

Three control systems, designated as two position, floating and proportioning control were briefly described by Mr. Hawkins in his paper on "Automatic Controls and the Paper Industry. In addition, a few general applications where electrical controls have already been applied in the paper industry were mentioned. Among the applications was a liquid level controller and a two-position motorized valve to maintain the desired level in a stuff chest; a two-position motorized valve and a temperature control of a dry loft; a two-position motorized valve wired to a magnetic starter to automatically supply water to a bale pulper; a proportioning motor operating in direct response to boiler pressure for regulating speed of stoker motor; a motorized valve with temperature controller responding to variations in temperature of condensate on a Yankee dryer; a pressure controller in the steam manifold with a proportioning motorized valve in the steam supply line for control of paper machine dryers, and an additional pressure controller and motorized valve to control the supply of make-up steam where necessary. Mr. Hawkins suggested that a careful study of each process would indicate what controls and control systems would be best suited for a particular installation.

Board Group Enjoys Four Papers

The papers developed for presentation before the Board Group meeting with S. M. Hesser of Hinde & Dauch Paper Co. as Chairman included *The Paper Mill Superintendent*, by A. W. Wickham of MacAndrews & Forbes Co., *Proper Co-operation and Paper Mill Supervision*, by E. C. Gildenzopf of Schmidt and Ault Paper Co., *The Duo De-Hydration Press Part for Cylinder Machines*, by Charles L. Ellis of Downingtown Mfg. Co., and *The Black-Clawson Vat*, by Allan Hyer of The Black-Clawson Co.

Mr. Wickham in his paper on The Paper Mill Superintendent, told of the qualifications for a superintendent of yesterday, today and tomorrow. The superintendent of yesterday had to know all of the various processes from the raw material to the finished product. The responsibility of the superintendent today was said to be more exacting than ever as he is directly responsible to the management for the quality, quantity and character of the product.

The tendency of the times, said Mr. Wickham, seems to be the consolidation of manufacturers of similar grades of paper into large units. These larger units will require an organization of departments additional to that of a superintendent, but the superintendent will be a practical technician, a man who has been through the mill and become a practical papermaker. Practical experience combined with his technical knowledge and skill, in the words of Mr. Wickham, will result in a valuable superintendent.

Mr. Gildenzopf in discussing "Proper Co-operation and Paper Mill Supervision," stressed the need for being fair—

fair to our fellowmen whether employee, employer, customer or neighbor. He suggested that every good superintendent should meet with all his department foremen and impress upon them the need for labor, study, thrift and sacrifice. To obtain proper co-operation, Mr. Gildenzopf said, all department costs should be discussed and the foreman making the best showing praised and the one whose cost is high for no good reason constructively criticized. In concluding his remarks, Mr. Gildenzopf stated, that the superintendent of today must be a diplomat, must be considerate, and should never ask a man to do more than he could do himself.

The paper by Mr. Ellis of the Downingtown Manufacturing Co. on "Duo De-Hydration Press Part for Cylinder Machines," was illustrated with a number of stereopticon slides. Mr. Ellis first explained the position of his company in developing this new equipment and then described the extractor roll, and the resultant combination of extractor units and suction presses which makes it possible to eliminate squeeze rolls and primary press rolls. The most effective combination in the opinion of Mr. Ellis was said to be two extractors, one suction primary, one suction first main press and two suction rolls. A list of mills which now have Duo De-Hydration was given, and it was further stated that more than 75 extractor roll units had been installed on machines ranging in width from 68 in. to 147 in.

The remaining paper scheduled before the Board Group meeting was that of Allan Hyer on "The Black-Clawson Vat." In this vat, it was stated, copper and steel have been employed in place of wood for the interior sections; and welded structural steel forms the framework to which the sheet copper is secured and this framework is bolted to cast iron ends on finished surfaces carefully drilled with jigs. Before reaching the cylinder surface, stock passes over a smoothly finished bronze delivery table which is set accurately level with the face of the mold. On the opposite side, the circulated stock is controlled by a regulating gate made of aluminum.

In commenting further on this development Mr. Hyer stated that the company he represented made over thirty-five years ago the first board machine over 100 in. wide. Then he mentioned the comparatively recent work done for the Bogalusa Paper Co., and other even more recent work including work that is in the shop at present. He also made mention of the fact that the method of forming a sheet on a cylinder mold, if anything, provides better control of cross tests than is possible with a Fourdrinier and cited a case to prove his contention.

Book and Fine Papers Group Convenes

Three papers were presented before the Book and Fine Papers Group meeting over which E. J. McDonnell presided as Chairman. One of these papers was entitled, *Paper Industry Standardization of Product and Its Relationship to the Superintendent.* This paper was the subject of F. C. Clark of Skinner & Sherman.

After comparing the per capita consumption of paper in the United States with several European countries and suggesting that the great multiplicity of styles, varieties and sizes of paper on the market is due to competition, Mr. Clark proceeded to define standardization. In its simplest sense it was said to refer to a means by which quantity, quality or value of a material, product or service that is established by law or common usage can be measured. The race for width of thirty years ago or thereabouts in the opinion of Mr. Clark has changed to a race for quality, production and economy of operation.

In the last ten years, he said, we have seen sulphite bonds made at 700, 800 and nearly 900 ft. per minute, and the paper made at these speeds is better in strength, color, cleanliness, formation and in every other respect than any all-sulphite bond of 20 years ago run at 100 ft. per minute. The very high grade bonds and ledger papers were stated to have shown the least change in manufacturing process during this period due to lack of demand; the 100 per cent sulphite bond, the 25 per cent rag and the 50 per cent sulphite bond being said to have largely replaced them.

The word, "standardization," therefore, said Mr. Clark, as applied to the operation of a pulp or paper mill means to get the most production at the lowest cost from each plant, and this at no reduction in quality. It was then suggested that every mill and every superintendent can apply standardization principles to individual conditions. The steps necessary, and these should be continually studied as trade conditions change, included the formation of a definite plan having a definite goal in view; the making of a complete plant survey, including power plant, manufacturing equipment, production capacity, and the routing of raw material through to finished product; the studying of raw materials used and processes required; and the studying of product desired and its suitability for a particular purpose.

The second paper was a joint contribution by Dr. F. W. Adams of the Massachusetts Institute of Technology and G. S. Witham, Jr., of the Parker-Young Co. The subject of the paper was *Scientific Control as an Aid to the Art of Papermaking.*

Control was classified under three major headings—control of furnish, control of treatment, and control of product, by Dr. Adams, who read the paper. Then he suggested that in this instance he was concerned primarily with the control of treatment which included the preparation of stock in the beater room and its handling on the machine. The most critical point in beater room operation, said Dr. Adams, occurs as the stock enters the Jordan stuff box where variations in furnish and previous treatment must be removed to produce a uniform paper. Rigid control of density of stock at this point and freeness of the Jordaned stock provides in the opinions of the joint contributors the two most valuable aids to uniformity of stock.

The density-controller-freeness recorder developed by Witham and Trimbey was described and examples of its value in detecting and correcting now uniform conditions presented. Variations in rate of flow of stock through the Jordan, in furnish and beater operation were stated to be eliminated by the papermaker using this instrument as a tool. Then the results of an extensive run on a special bond paper were presented in detail, showing beater room and machine room records as well as the physical tests of the paper produced.

The third and last paper presented before the Book and Fine Papers Group meeting was read by E. J. McDonnell in the absence of L. M. Yoerg and R. W. Pattison, both of the American Writing Paper Co. and contributors of the paper. The subject was *Paper Machine Press Rolls* and in it the need for arriving at a happy medium as to hardness and crown was emphasized. It was likewise suggested that the face of the roll should determine its diameter, and that both the face and diameter should determine the crown. It was also stated that the top roll should be offset, and that all of the water possible should be removed during the early stages since the production of most machines is limited to the water removal efficiency of the press part.

The subject of rubber covered rolls was then touched upon and as soon as the reading of the paper was completed the meeting was thrown open for discussion on the cause and cure of rough and grainy edge paper. This discussion was particularly interesting and helpful as many of those in the meeting felt free to tell of their experiences.

The Emerson-Mason Dancers, after the group meetings of the afternoon were completed, entertained all delegates and guests on the hotel lawn with two numbers. One of the numbers was entitled "Seaweed," the other "Indian Fantasy." The dances in both numbers were in costumes that cleverly portrayed the subject of the dance.

Thursday Evening Program

The evening program of the second day, Thursday, June 21, included both a dinner and a costume ball. The toastmaster at the dinner meeting was N. R. Davis and the speaker of the evening, Whiting Williams of Cleveland, Ohio.

Mr. Williams spoke on the *Manager and Man Under the New Deal.* He told of many of his experiences during the past fifteen years in studying the problem of the worker and those out of employment. He said that he had found it possible to get very close to the workers in Great Britain, France, and Germany as well as, of course, in the United States. In making these personal studies, he felt that at one time that co-operation between employer and worker was the secret of improving industrial relationships. The New Deal, however, has caused him to doubt, and now he has come to feel that the greatest difficulty today is confusion in thinking by the

government and the people. This confusion, in the belief of Mr. Williams, is exhibited in the thought of a 30-hour week to simply spread out jobs evenly. He stressed the need for constantly expanding the level of living and said that by doing so there would be an increase in the total number of jobs.

The relation between the employer and employee, however, was said to be never so ideal as at present. The employer in this country was felt to represent a better combination of honesty, fair play, and intelligence than anywhere else in the world.

The N.R.A., said Mr. Williams, is proving helpful along certain lines, but business needs even more assurance from the Government, and the business man needs to hold up his chin. He expressed the hope that the American business man would see the tremendous part he must play to increase the level of living, and suggested that individual honesty, fair play, and inventiveness were needed.

In concluding his remarks, Mr. Williams stressed the fact that we are going to come back and requested an increased amount of patience with democracy.

Papers of Friday

On the morning of June 22, the last day of the convention, the sessions for the day opened with Mr. Randall in the chair. The first paper on the program of the day was presented by Dr. John H. Graff of the Institute of Paper Chemistry on *New Stains for Fibre Evaluation and Identification.*

After briefly reviewing the history of a number of the common stains used by paper technologists, he mentioned that the drawback with most of these formulas is that they are double stains, that the proportions of the composition often are very vague, that some of the stains require an undue amount of time and that the descriptions of the color differentiations given by the stains to different fibres are practically useless. The correct analysis of a paper containing only the most common fibres, in the opinion of Dr. Graff, depends to a large extent upon the integrity of the analyst and the relative amount of analysis made by him each day.

The need for a new stain for distinguishing new fibres and at the same time the need for a single stain that would make as many differentiations as possible resulted in a separate study of all the stains published and the development of a number of modified stains which were given an alphabetical nomenclature. The dyeing characteristics of each one of the various stains thus developed were then explained and the technique for evaluating the characteristics of fibres in each individual pulp by staining methods given. In summing up what has been done in the development of new stains, Dr. Graff said, that there are staining methods whereby not only the degree of cooking of any pulp can be determined, but also the uniformity of the cooking of the individual fibres in that pulp is shown; the bleaching of a pulp can be determined by staining; the uniformity of the treatment of the fibre, bleached or refined, can be determined by another stain; and that all of these three stains, "Cooking," "Bleach," and "Purity Factor" supplement each other.

Dr. Graff's paper was followed by a paper by Dr. L. C. Lewis of the Mead Corporation on *Standard Brightness Testers.*

After explaining the meaning of the term "Brightness," Dr. Lewis told why it was of such high commercial value mentioning that a little added brightness increases the contrast of the unprinted sheet with the black printed areas. He then commented upon experience with brightness rating and in so doing suggested that no dye will raise the grading; that in the white paper field blue and pink dyes do not lower the brightness grading appreciably in the amounts used; that if a bleached and an unbleached pulp each be dyed to the satisfactory "blueness" the unbleached will be worse off in a brightness comparison than before the dyeing; and that if we used brightness as ordinarily rated by commercial tests for lamps, etc., we should rate a natural sheet higher than a sheet dyed to a blue white, made from the identical furnish by the identical process as the natural sheet.

Considerable emphasis was then placed by Dr. Lewis upon the operation of the brightness tester. The process of judging brightness by eye with its accompanying variables was first explained and then the advantages of the brightness tester cited. For its special job it was said to make all judgments without error; that it enables us to use permanent standards; that it makes it possible for a brightness figure to mean the same thing all over the country a year from now, five years from now or a month ago; and that it is about ten times more sensitive to brightness differences than the eye.

The last paper on the morning program of the last day of the convention was entitled *Some Economic Considerations in the Selection of Paper Mill Drives* and was presented by R. R. Baker of Westinghouse Electric & Mfg. Co.

Mr. Baker first outlined the factors of a well-balanced design of electric drive. These factors included: functional efficiency as it affects machine availability and quality production; mechanical, electrical and thermal efficiency as they affect operating cost; maintenance and operating costs as they are affected by the selection of a particular type of drive; and first cost and fixed charges. Each one of these factors was discussed from the economic viewpoint; it being stated that functional efficiency becomes a measure of the productive availability of the machine; that an improvement in mechanical and electrical efficiency results in a direct power savings, the value of which depends upon the marginal cost of power and the extent of the power savings; that improvements in thermal efficiency result from higher initial operating steam pressures and temperatures, improvement in the performance of prime movers, or a better utilization of the steam required for both power and process work; and that frequently the operating costs are directly affected by the type of drive to be applied. At this point, Mr. Baker made some comparisons between the section electric, single motor mechanical, and variable speed turbine mechanical drives for paper machines. The use of regenerative braking and automatic tension control in connection with unwinding stands of winders or rewinders, as well as a form of drive designated as "The Electrical Lineshaft" was touched upon. In addition, Mr. Baker mentioned that motors might be equipped with thermo-guard protection and suggested the use of no fuse De-ion circuit breakers in place of fused disconnect switches. The use of geared type induction motors on Jordans and beaters and the advantages of gear motors were also outlined.

Luncheon Program on Friday

At the noon-day luncheon on June 22 with John E. Hyde of the S. D. Warren Co. as toastmaster, remarks were made by the Honorable Louis J. Brann, Governor of the state of Maine. Governor Brann expressed the hope that everyone in attendance at the convention was having a pleasant, profitable, and agreeable time. He added that if one would see and appreciate Maine, it was only necessary to look around. The pulp and paper industry of the State then received recognition. He stated that Maine was the greatest pulpwood producing state in the United States, and that within the state approximately one-half of all the newsprint made in the nation was produced. He said that he stood for stabilization of the paper industry on the basis of profit for the producer, and that the theory of reconstruction must be the saving and preservation of the industries we now have. In closing his remarks the governor expressed the hope that at some future time as an organization or as individuals that each one present might feel the urge to return to the State of Maine.

The remarks of Governor Brann were followed by the remarks of Dr. Clifton D. Gray, president of Bates College, on *Democracy vs. Fascism.* Dr. Gray expressed the belief that current thought today is away from democracy, and listed Great Britain, France, and the United States as the only three great democracies left in the world. The ideas of Fascism, said Dr. Gray, are opposed to the spirit of Americanism, and the battleground on which these ideas must be fought out is in the realm of the spirit. The logical end of Fascism, in the opinion of Dr. Gray, is that of a totalitarian state where the press, churches, schools, theatre, music, labor, sports, etc., are all lined up with the purposes of government.

Dr. Gray asked, "Is this country ready to pay the price of dictatorship?" The costs of dictatorship were said to be loss of liberty to think, speak, and write.

Then Dr. Gray placed emphasis on the fact that democracy needs a free and untrammeled press; that we need a free educational system with its chief aim being to discover and present the truth; and that disaster would face us if the press were controlled by Washington. He concluded his remarks by saying that he had increased faith in democracy; that liberty still possesses real significance and meaning; and that "My Country 'Tis of Thee" will be sung for some time to come.

Election of Officers

At the business session which followed promptly after the luncheon, K. E. Terry of the S. D. Warren Co. and general chairman for the 1934 convention was elected president of the association for the ensuing year. The other officers elected included Robert L. Eminger, secretary-treasurer; Charles Champion, Millers Falls Paper Co., first vice-president; Frank J. Timmerman, Northern Paper Mills, second vice-president; B. D. Millidge, Howard Smith Paper Mills, third vice-president; George M. Trostel, The Champion Fibre Co., fourth vice-president; and C. E. Youngchild, Southern Kraft Corporation, fifth vice-president. Each of these officers was elected unanimously.

Papers of Afternoon Meeting

At the general meeting of the afternoon session Clark C. Heritage, president of T.A.P.P.I. and associated with the Maine Coated Division of the Oxford Paper Co., presented a paper on *The correlation of Research with Mill Operation.* In this paper Mr. Heritage explained the differences existing between research and operation. He said that the research man secures facts with which to answer problems, and that his success comes from certain changes for the better. Plant experimentation was briefly touched upon.

Then Mr. Heritage stressed the necessity for the management, research staff, and operating staff having a clear picture on the nature of the products to be manufactured and the relationships involved in making these products. Emphasis was also placed upon the use requirements as well as the interrelation between the use requirements and properties of the products. The values of these properties, said Mr. Heritage, must be determined in establishing the nature of products to be manufactured and price must be considered. With these values once established manufacturing specifications thus become available. A clear understanding of relationships, however, beginning with use requirements and the nature of raw materials was said to be needed.

In discussing the selling value of research to an organization, Mr. Heritage pointed out that it must start at the top and that all doubt must be removed insofar as the attitude of the management is concerned. Three lines of research were suggested. They included sales development, cost reduction, and new sources of profit.

The importance of the proper attitude of the research organization itself also received consideration. Research employees were said to be fact finders who must have an inexhaustible supply of perseverance, tact, and loyalty. It was suggested that in selling research to the operating staff that the early problems should not be too difficult or complex.

In the opinion of Mr. Heritage, as a general rule, there is too much secrecy thrown around the work of the research department and that nothing is more deadly than reporting unreliable and inaccurate information in the correlation of results.

Controlled Production was the subject of the last formal paper of the convention. It was the subject of Arthur C. Smith of the Racquette River Paper Co. Mr. Smith stated that in order to meet the exacting requirements of the trade, it was necessary for them to develop a control system with the thought behind it of supplying uniformly prepared stock to the machines at a uniform density. Such a system, when developed, consisted of four component parts —slush, size, alum, and water. Details of the layout of the complete system were then given, and the method of operation explained. To wash up the system it was said to be necessary to open but one valve and to let fresh chlorinated water flush out the pipes and pass out the drain.

The success of the system, in the opinion of Mr. Smith, has been its simplicity of operation. A control man sets a controller for the amount desired. The beater man opens a valve when ready and the correct amount is metered to the beaters without any attention. When the beater man sees the stock, size, alum, or water stop, he simply closes the valve and the amount and time is recorded with the human element eliminated. The controls are changed only with changes in furnish.

Between the time of closing the afternoon session and the banquet of the evening a band concert was rendered by the 240th Coast Artillery (H.D.) Band, M.N.G. The concert was held on the beautiful lawn of the hotel grounds.

Banquet Meeting

Judge Benjamin Cleaves of the Associated Industries of Maine was toastmaster at the evening banquet. During the banquet hour Eugene Bechard of the Eastwood-Nealley Corporation was called upon to present the Eastwood cup to Herbert Randall as the winner of the golf trophy for the third time. Mr. Randall was also presented with the L. D. Post Memorial trophy, a Hamilton watch, by John Cornell, associate editor of *The Paper Mill and Wood Pulp News.* This trophy was awarded to him on his retirement as president of the association. In addition to these two awards, Mr. Randall was likewise presented with the past presidents jewel. This presentation was made by E. T. A. Coughlin of Pettingill, Inc., a former president of the association.

A wrist watch was presented to K. E. Terry as a token of appreciation for his efforts in handling the affairs of the convention. This presentation was made by John S. Schumaker in behalf of the association. Mr. Terry in accepting the watch asked for co-operation with the hope of building, if possible, a greater structure and organization. He also expressed the appreciation of his various committees to the mills and many friends in the allied industries for their help in making the fifteenth annual convention a success. He then thanked each one of his committee chairmen, announcing their names, for their help and presented a beautiful coffee set to Mrs. L. P. Parkman as a token of appreciation for her efforts in arranging the excellent program for the entertainment of the ladies.

Several very pleasing coronet solos were played during the course of the evening by Randolph Brooks, a fourteen year old boy from Sanford, Maine, who has played as guest artist with Rudy Valée on some of his radio broadcasts. The accompanist for Mr. Brooks was a very talented young lady of only fifteen years.

Major General Smedley D. Butler Guest Speaker

The speaker of the evening was Major General Smedley D. Butler, retired, U. S. Marine Corps. General Butler told most interestingly of a number of his army experiences and from these reminiscences he developed most logically some thoughts pertaining to the handling of men. He said that no man can lead other men unless he has a strong character; that the future of the pulp and paper industry rested upon such men as the superintendents whom he likened to a keystone; and that when men are faced with a difficult situation to feed them. To prove his last contention as in amplifying some of his other statements he referred to personal experiences at Brest, France, at the time of army demobilization. He suggested that those in authority should always lean on the fairness and squareness of those under them; that a sensible order given in a sensible voice will get men to do what is wanted of them; and that to get along with other people required that one be thoroughly human.

General Butler commented that he had never asked a man to do anything that he wouldn't have been willing to try. The use of a lot of dramatics, sacrificing oneself at the proper time if necessary, was given as a means of getting things done. In continuing, he said, that a good many people never know what they can do until they try.

He praised the idea of getting together for a convention or a meeting, saying that it was there that one learned to play and to iron out little jealousies, and that each year one would learn something—learn that change had taken place.

The convention ball was held immediately after the banquet program and it served as a fitting climax or grand finale for a convention that many expressed as the very best in the entire history of the association.

Exhibits of Manufacturers

No report of the convention, however, would be complete without mention of the various exhibits displayed throughout the duration of the convention by various manufacturers.

Automatic Transportation Co., Chicago, Ill., displayed one of their "Automatic" Model "TMTF" tilting fork trucks for the handling of paper pulp. This truck, utilizing a special appliance in place of the forks, might also be used for handling bales of scrap paper and rolls.

Barrows Co., George A., Boston, Mass., as a representative of the Modine Manufacturing Co., Racine, Wis., exhibited a complete Model 710 unit heater as well as a cut open heater showing internal construction.

Beacon Wiper Supply Co., Chelsea, Mass., had samples of their products on display and presented a list of representative users.

Blake & Co., W. L., Portland, Me., exhibited numerous products as representatives of E. C. Atkins Co., Black & Decker, Fafnir Bearing Co., Goodyear Tire & Rubber Co., Graton & Knight, Jeffrey Manufacturing Co., Jenkins Co., Keystone Lubricating Co., Mueller Brass Co., Rockwood Manufacturing Co., and Simonds Saw & Steel Co.

Bristol Company, Waterbury, Conn., displayed a number of their control instruments. Among them was a sulphite digester recorder; free vane, record controller thermometer; recording pressure gauge; and a diaphragm operated valve.

Brown Company, Portland, Me., displayed Solka (the trade name for the range of Alpha fibres made by the company) and specimens of various papers made from it, as well as paper cores, and samples of various sulphite and sulphate pulps.

Cameron Machine Company, Brooklyn, N. Y., utilized numerous photographs arranged on easels to show typical installations of their slitters and rewinders.

Century Electric Company, St. Louis, Mo., demonstrated in their exhibit a splash-proof and explosion proof motor and showed both magnetic and manual C-H controls for the explosion proof motor.

Chain Belt Company, Milwaukee, Wis., through the use of several panels showed various types of chain manufactured by them. In addition, a three-roll Stearns belt conveyor idler was exhibited, as was a group of photographs arranged on a panel showing typical installations of their chain in pulp and paper mills.

Chase Brass & Copper Co., Waterbury, Conn., exhibited a panel showing how to make a sweated joint. Tubing of different wall thicknesses and diameters, elbows, coils, sheets, and special fittings were also displayed.

Cheney-Bigelow Wire Works, Springfield, Mass., emphasized their new internal trunnion dandy in their exhibit. The roll was shown to be made up of triangular bars to facilitate water removal, and with winding wire that was also triangular in nature. The exhibit roll also included both a sewed and a soldered seam and an internal water and steam by-pass for cleansing and cooling the dandy and for keeping bubbles down in the stock. The by-pass arrangement rested on the machine frame so it placed no additional weight on the dandy proper.

Chromium Corporation of America, New York City, had on exhibit typical examples of their work. Chromium plated screen plates of both flat and curved designs, suction box covers, slice lips, shower pipe, grinder burrs, condenser tubes, pulp screen plate, wire guide pan, and press rolls for size press, smoothing press, and regular machine press were shown as was one of the new models of Green's slowness tester.

Combustion Engineering Co., New York City, emphasized the Murray-Waern soda and sulphate recovery system through the use of a large drawing showing its construction.

Cutter, Wood & Sanderson, Cambridge, Mass., as representatives of the Quigley Co., New York, displayed their line of refractories, sealing compounds, protective coatings, and felt cleaning compound.

Dodge Manufacturing Corporation, Mishawaka, Ind., exhibited one of their Diamond D safety clutches, together with their line of Dodge-Timken bearings, roller bearings, Type D-H ball bearings, bronze oil bearings, and D-V variable speed motorized transmission. The clutch and variable speed drive were demonstrated in operation.

Duriron Company, Dayton, Ohio, showed a Panzl strainer for use in sulphite digesters, a Durco valve, and a cutaway section of some special fitting.

Fairbanks Company, New York City, exhibited their complete line of iron and brass bodied valves, special Sphero ball valve, Dart unions and Fairbanks series 500 vulcanized rubber tired wheels and casters.

Gerrard Company, The, Chicago, Ill., showed, in miniature, box cars loaded with paper rolls which were tied in position with wire. Paper bundles on skids, also in miniature and with the paper held in position by wire, were likewise shown. In addition, samples of actual wire used for such a purpose and the tools required for using it were exhibited.

Harbison-Walker Refractories Co., Pittsburgh, Pa., showed typical suspended arch shapes as made for M. H. Detrich Co., American Arch Co., and Bigelow-Liptak Co. They also exhibited digester lining brick, fireclay brick, silica brick, magnesite brick, chrome brick, acid proof brick, insulating brick, packing rings, and high temperature cements.

Hendrick Manufacturing Company, Carbondale, Pa., exhibited a number of pieces of perforated stainless steel plate.

Johns-Manville, New York City, had an exhibition which showed their Transite pipe Dresser coupling, moulded brake band paper rewind, Transite pipe Simplex coupling, brake block paper rewind, rotproof insulated roof, friction block clutch inserts, panel of various packings, F & C lining, block type split bearing, solid bearing, doctor blade, suction box cover, panel of asbestos millboard, pipe covering, felt block, magnesia blocks, and other insulating materials together with a diagram showing the application of J. M. No. 50 Eel-Slip material to the wet end of a paper machine.

Kron Co., Bridgeport, Conn., placed on exhibit one of their springless 500 lb. dial scales.

Lebanon Steel Foundry Co., Lebanon, Pa., exhibited some corrosion resisting steel castings as used in pumps, valves, fittings and in sulphite digester service.

Link Belt Company, Chicago, exhibited as a companion to their PIV variable speed unit a VRD variable roller drive. This drive is a new fractional horsepower unit.

Mason-Neilan Regulator Co., Boston, Mass., showed a steam flow recorder for sulphite digester service; ball bearing liquid level controller for condensate receivers and tanks; recording temperature controller with thermo-pressure compensation for paper machine drying control; differential pressure regulating valve for maintaining pressure differential between dry and wet end of paper machine; and a recording thermometer for temperature record of water, air, and steam throughout the mill.

National Tube Company, Pittsburgh, Pa., had on exhibit some sections of stainless steel angles, plates, worms, tubes, coil, and pipe.

Plibrico Jointless Firebrick Co., Chicago, featured their plastic firebrick refractory anchors and line of refractory products.

Ruggles-Klingemann Mfg. Co., Boston, Mass., in their exhibit gave prominence to their Thrustor operated blance valve for controlling steam, water, or other liquids where quick operation is nesessary; and to their dual motor pressure controller for controlling exhaust and live steam to paper machines.

Sinclair Company, Holyoke, Mass., exhibited actual examples of unusual watermarks arranged to show the design in the paper, watermark designs in wire cloth, several dandy rolls showing construction, wireless seam for dandy roll, and a new dandy roll design of large diameter and supported on trunnions. This large diameter roll was the feature of the exhibit.

Sprayco, Inc., Somerville, Mass., as manufacturers of nozzle equipment for cooling, washing, atomizing, etc., utilized a demonstration apparatus to show effects produced by nozzles of different designs. The use of a flat spray nozzle for washing of felts and wires of paper machines where a limited supply of water is available was emphasized.

Sturtevant Mill Company, Boston, Mass., had set up in their exhibit a Poirier weight governor, and a large photograph of their bale pulper.

Timken Roller Bearing Co., Canton, Ohio, arranged their exhibit around a typical Timken calender roll bearing and housing assembly (courtesy B. F. Perkins & Sons, Inc., Holyoke, Mass.), top and bottom roll calender bearing

4 row type, flanged cup type bearing, NA type bearing, standard single row bearing EE type with close guided rolls, intermediate calender roll bearing, steep angle bearing used where thrust loads predominate, and a typical supercalender intermediate roll bearing and housing assembly (courtesy B. F. Perkins & Sons, Inc.).

Toledo Scale Co., Toledo, Ohio, displayed a Toledo beater roll scale and recorder mounted on a 20 pound E. D. Jones beater. With this device it was pointed out that the operator can control the beater so that any required amount of pressure can be exerted by bringing the scale pointer to that reading on the dial. The device also makes a record of the pressure indicated.

Walworth Company, New York City, showed their line of threadless bronze fittings, acid resisting valves and fittings, lubricated plug valves, cast steel valves, bronze valves, pipe wrenches, unions, and a testing machine to demonstrate the practicability of the threadless bronze fittings.

Warren Steam Pump Co., Warren, Mass., featured a special vertical centrifugal pumping unit that was directly connected to a G. E. motor.

Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa., emphasized in their exhibit their line of micarta products as well as their electrical equipment. In the micarta exhibit were samples of a suction box cover, bearing, table roll cover, shake spring, doctor blade, piston ring, valve disc for pumps, toe block for diaphram screens, and of gears for miscellaneous use. The electrical exhibit included a standard induction motor with seal sleeve bearings; industrial analyzer for portable testing of electrical equipment; light meter; standard line starter with start and stop buttons in cover; Thermoguard motor; two circuit breakers; and a combination microphone photocell and magnetic relay outfit for demonstrating the function of each.

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◆ American Cyanamid Acquires Burton Explosives

American Cyanamid & Chemical Corporation announces the acquisition, effective July 1st, 1934 of the plant, properties, and business of Burton Explosives, Inc., Cleveland, Ohio, which latter company has since its organization in 1930 been engaged in the manufacture and sale of high explosives and blasting supplies.

The explosives plant, covering 415 acres, is located at New Castle, Pa. with a capacity of 18,000,000 pounds annually. The plant is complete for the production of commercial high explosives and is designed to prepare and manufacture a number of the raw materials used. Plant and processes are the result of the long experience of Mr. Burton and his associates. The processes and methods installed result in an extremely economical operation.

The acquisition of this company brings to the American Cyanamid Organization a large production of high explosives and an established distributing organization covering twenty states with magazines conveniently located to serve the trade in that area. "Burton Explosives" have been well and favorably known. Their high standards of quality and service will be maintained and expanded.

J. S. Burton, President of Burton Explosives, Inc., brings to American Cyanamid Organization a thorough knowledge of the explosive business together with a manufacturing and sales organization of experienced men of proven ability in their respective fields. Mr. Burton has been connected with the industry since 1895.

The business of Burton Explosives, Inc. will be carried on as the Burton Explosives Division of the American Cyanamid & Chemical Corporation, 30 Rockefeller Plaza, New York, N. Y.

◆ Whiting Corporation Has Fiftieth Anniversary

The year 1934 marks the 50th anniversary of Whiting Corporation, with Mr. John Hill Whiting, the founder, still active as Chairman of the Board. Mr. Whiting began his business career in Detroit in the seventies as a clerk in a car wheel factory. Eager to learn, he did most of his clerical work at night and spent the days acquiring a practical knowledge of the foundry business. Before many years he rose to Superintendent and earned a substantial share in the company.

The World's Fair of 1893 brought Chicago into prominence as the business center of the Middle West. After much study, Mr. Whiting determined to locate in the Chicago area and in 1894 built a small portion of the present plant at Harvey, Illinois, and began to do business under the name of Whiting Foundry Equipment Co. (later this name was changed to its present form—Whiting Corporation). As the leading manufacturor of cupolas and foundry equipment, the company acquired a national reputation, and gradually other lines were added: electric traveling cranes, special shop equipment for railroad terminals, and a variety of special machinery for power plants, steel mills, by-product coke plants, etc. The first successful gasoline motor trucks for commercial use were designed and built in the Whiting plant as far back at 1904.

As time went on, other companies were taken over as subsidiaries, including the Swenson Evaporator Co., manufacturers of evaporators, crystallizers and filter equipment for the process industries; the Grindle Fuel Equipment Co., one of the pioneers in pulverized coal machinery; and the Joseph Harrington Co., manufacturers of automatic stokers for industrial and commercial use. The latest addition is a complete line of stokers for domestic and commercial use. With its standard lines and those of its subsidiaries, Whiting Corporation today serves practically all industries and a wide range of commercial enterprises, also homes, schools, hospitals, and institutions of all kinds.

Closely associated with Mr. Whiting for the past thirty years and now President of Whiting Corporation, is Gen. T. S. Hammond. Along with his service to the company, Gen. Hammond has participated very widely in business association activities and military affairs including service in France with the Rainbow Division. He was one of the first to be called to Washington for duty with the N.R.A. He is perhaps best remembered as the Tom Hammond who was Michigan's star half-back in the early 1900's.

The third generation is represented by Mr. Whiting's grandson, Stevens H. Hammond, Assistant to the President. There are thus three generations in active direction of the company.

◆ Combustion Engr. and D. J. Murray Become Associated

Combustion Engineering Company, Inc., of New York, and D. J. Murray Manufacturing Company of Wausau, Wisconsin, announce that they have concluded an agreement for the joint development, manufacture and sale of the Improved Murray-Waern Chemical Recovery System. This system applies to the soda and sulphate pulp and paper manufacturing processes. Its particular advantage is that it provides, in conjunction with a well-established method of chemical reclamation, the necessary equipment for highly efficient heat recovery with correspondingly large production of high pressure steam. The entire system represents a thoroughly coordinated overall design with the operating advantages of low labor and maintenance cost and exceptional cleanliness.

The combination of the experience and the manufacturing facilities of these two organizations permits the design, manufacture and installation of complete Murray-Waern systems under a single contract and responsibility.

◆ Plan for New Paper Mill in Alabama

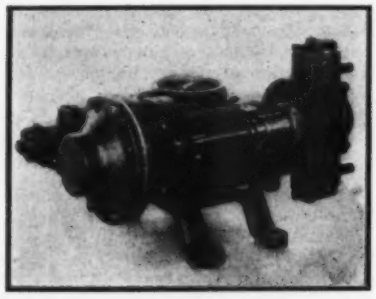
Plans for the construction of a paper mill in Alabama to manufacture newsprint from pine pulp after a process discovered by Dr. Charles H. Herty, of Savannah, were recently formulated at a meeting of 100 industrialists, chemists and economists in Birmingham. The Alabama Conference on Paper Products from Alabama Pine was organized with Thomas W. Martin, president of the Alabama Power Company, as permanent chairman; Julian McGowin, Theodore Swann, Col. Page S. Bunker and Dr. L. N. Duncan, vice-chairman, and A. B. Collins, secretary.

The meeting adopted resolutions presented by Victor H. Hanson, publisher of the *Birmingham News and Age-Herald*, recommending that the conference consider immediate possibilities of manufacturing print paper from Southern pine. Information about Alabama forests and Kraft mills now in operation will be compiled and published. Tax exemption will also be asked for paper mills to be located in the state.

◆ Water Sterilization Device

An apparatus, designated as the Chlor-O-Feeder, has been announced by %Proportioneers%; Inc. of Providence, R. I., for feeding all forms of chlorine bearing solutions into water and stock lines. The flow is said to be actuated by any flow responsive device such as a standard water meter, rotor, or Venturi meter, and it can be operated at any point where the line can be cut to make the installation.

The manufacturer also claims that the Chlor-O-Feeder functions in strict ratio



to flow changes, and starts, varies and stops the dosage without manual attention.

The dosage is adjustable and can quickly be changed by 1/100-inch stroke length increments which are indicated on a micrometer scale. Intimate contacting of the reagent with the throughput is said to be assured, as small increments of the water or stock being treated are each given the proper injection of the sterilization solution.

In addition to the apparatus for permanent installation, the manufacturer produces a portable unit which is suggested for use in chlorinating dead-end mains, sterilizing new pipe or as a stand-by unit.

Complete information on the Chlor-O-Feeder may be obtained without obligation from the manufacturer.

◆ New Smoke Recorder

A new photo cell smoke density recorder compensated for variations in light source intensity and operated by the Galvatron electronic relay circuit has been announced by Bailey Meter Company, Cleveland, O. This equipment

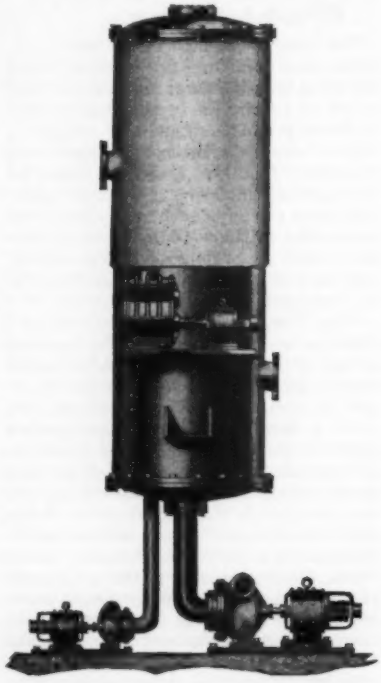
consists of a receiving element in the form of an attractive recorder which is usually mounted on the individual boiler panel board and a transmitting element consisting of a projecting cylinder and a detecting cylinder which are mounted on opposite sides of the breeching or flue gas passage.

A continuous record of relative smoke density is made by the recorder on a 12-inch uniformly graduated recording chart. This record clearly indicates stack conditions at all times, night and day, showing definitely each period of tube blowing.

A hinged panel within the dustproof pressed steel recorder casing provides the chart plate on one side and on the other side an easily accessible mounting for the sensitive galvanometer and electronic relays of the Galvatron. This recording Galvatron is similar in many respects to the Bailey Galvatron potentiometer pyrometer.

◆ Steam Operated Water Cooler

A new development of the Elliott Company, Pittsburgh, Pa., a steam operated water cooler, produces cooled water by means of flash or instantaneous evaporation under vacuum. This unit is said to



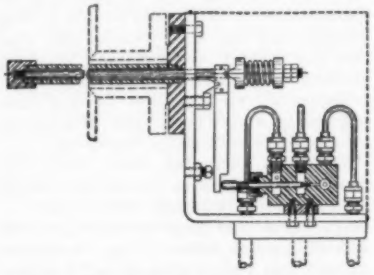
provide an economical means of supplying cooled water for drinking purposes, cooled water for use in unit or central air coolers and humidifiers to supply cooled air to shops and offices, and other applications where it is desirable to use water cooled to between 40 and 50 deg. Fahr.

This cooler is fully contained within a single tank.

◆ Thermo Regulator

To control the temperature of steam after it has passed through a reducing and desuperheating station is the function of a Thermo Master Regulator, recently announced by The Swartwout Co., Cleveland, Ohio.

The mechanism consists of a thermostat made up of two different pieces of metal having different co-efficients of expansion. The operating element of the regulator is inserted in the steam line on the outlet side of the desuperheater. The power thus developed is transmitted through a lever to a three-way valve. This three-way valve admits pressure to or relieves pressure from the main diaphragm operated valve controlling the water supply to the desuperheater. The device is built for controlling temperatures as high as 1000 deg. Fahr. and incorporates special safety



features for protecting working parts in event of failure of water supply to the desuperheater.

It is also suggested that this regulator can be used on any temperature control system where one large or a number of valves may be in operation and where it is essential that accurate temperatures be maintained.

◆ Combination Test-Lite and Fuse Puller

The Ideal Commutator Dresser Co. of Sycamore, Ill., has placed on the market a handy device for pulling or inserting fuses and for testing electrical circuits. The device is made like a pair of pliers from reinforced, molded bakelite. Test pins are provided at the ends of the handles so that by opening or closing the handles it is possible for the pins to span to all opposite polarities found in electrical circuits within the capacity of the tool. A test lamp is also enclosed in one of the handles.

The over-all length of the standard device is 7 inches. This unit is designed for pulling or inserting fuses ranging in capacity from 30 to 100 amperes, and for voltages from 250 to 600. Larger sizes are made to order.

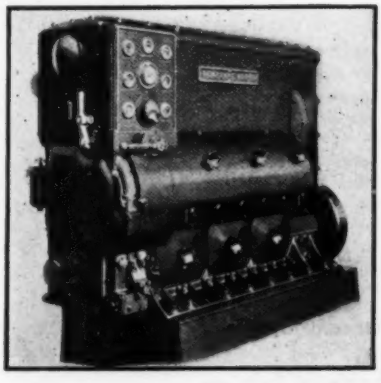
◆ An Opposed Piston Diesel Engine

Light weight and reduced space requirements of the new Opposed Piston Diesel constitute the latest contribution of the Fairbanks-Morse organization to industrial development. While this engine is designed primarily for installations where weight and space are important factors, such as for marine and mobile equipment, it is claimed to be

equally adaptable for stationary work.

It has two short, large diameter crank shafts with a synchronizing connection which makes for extreme compactness. The control features are unusual as the three functions of regulating injection timing, pressure and quantity are centered in a single lever. Response is rapid and accurate and the engine may be changed from idling to full speed in only a few revolutions or maintained indefinitely at any intermediate speed within very narrow limits.

The elimination of cylinder heads by confining the combustion space between the two pistons is claimed not only to improve combustion but also allows better cooling facilities at this point as well as eliminating the necessity for gaskets. The frame is of rigid light weight construction which together with the use of aluminum for parts not subjected to stress, such as cover plates, etc., makes for extreme light weight with no reduction in strength. All water and oil piping is permanently tight as are also the intake and exhaust manifolds. Built-in duplex rotary scavenger blowers are provided and the uniflow principle of scavenging is employed. Other built-in auxiliaries include lubricating oil pumps—fuel oil service and transfer pumps and circulating water pumps.



This engine is available in five cylinder sizes, 5 by 6 in., 6½ by 8, 8 by 10, 10 by 12 and 12 by 15 in. and in 6, 7 and 8 cylinder combinations with a 5 cylinder size in the smallest bore. Power capacities range from 50 to 300 hp. per cylinder or for the engine, from 250 to 2400 hp.

◆ Press Board Glazer

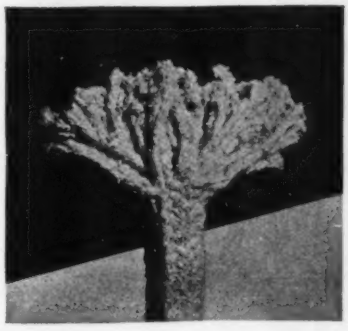
The Smith & Winchester Manufacturing Co., South Windham, Conn., has developed a new glazer for press board work.

The manufacturer claims that in actual mill service this glazer has been accomplishing in one pass what formerly took two passes and getting a much better finish. One machine, recently manufactured, weighed over 7 tons; yet it operates with perfect freedom. Roller bearings are used on the glazer wheel and a special hanger and wedge shoe gives maximum pressure. Further information about this machine will be furnished by the manufacturer upon request.

◆ Interlocked Braided Asbestos Packing

Johns-Manville, 22 East Fortieth St., New York, has announced a new packing for reciprocating and centrifugal rods to be known as Interlocked Braided Asbestos Packing.

Each individual strand of long fibre asbestos yarn is so interlocked in the



braiding as to provide a packing with a completely integral braided structure. There are no soft, heavy plaits to flatten; and no jackets to wear through. Because it is braided square, rather than pressed into shape, it is said to assure a better packing face on the rod, with more contacting area. The integral structure also results in greater resiliency and flexibility.

J-M Interlocked Braided is recommended for packing against saturated or superheated steam; hot or cold, fresh or salt water; and weak caustics and acids.

◆ Integral-Furnace Boiler

The Babcock & Wilcox Co., New York, has announced a new boiler unit, designed to provide a completely co-ordinated unit comprising a two-drum boiler, a water-cooled furnace; burners for liquid, gaseous, or pulverized solid fuels; and, when needed, a superheater, economizer, and an air heater. This unit is said to be particularly applicable for industrial plants where operation at high nominal ratings with high final steam temperatures, and where high efficiency is desired.

The two side walls of the furnace are of Bailey Stud-Tubo construction employing tubes, suitably spaced with the spaces between the tubes filled with plastic refractory material secured in place by studs welded to the tubes. The floor is water cooled, the tubes being covered with standard Bailey Baro-Metal blocks and connected to a common header with the outer sidewall in such a manner that positive circulation is assured through the floor and the wall. The rear wall, of refractory construction, is protected by a row of bare water-cooled tubes. Protection of the boiler tubes and superheater is obtained by a slag screen, formed by the first two rows of boiler tubes.

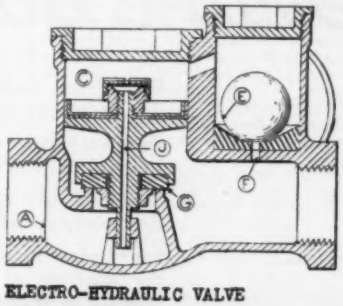
The boiler tubes are arranged in three passes, and are so spaced as to secure maximum heat transfer consistent with a draft loss that is sufficiently low to permit operation with natural draft up to fairly high ratings. The tubes in the first pass are 3¼ inches in diameter, and the diameter of those in the succeeding passes is 2 inches. Thus, those tubes subjected to the most severe conditions, and in which scale is most liable to accumulate, are of large size and easy to clean.

The drums are of fusion-welded or, if desired, riveted construction. The lower drum rests upon cast-iron saddles, which, in turn are supported by footings. It is anchored by the saddle near one end, but is free to move at the other end. The upper drum is supported by beams carried on corner columns and, in the larger sizes, by auxiliary guides and supports secured to the buckstays and rear corner angles. It is equipped with the necessary steam-and-water separator to assure the delivery of dry steam. Steam enters the dry pan at the front of the boiler where the water is comparatively quiet, passes over the length of the dry pan, and is taken away from the rear of the drum to the superheater.

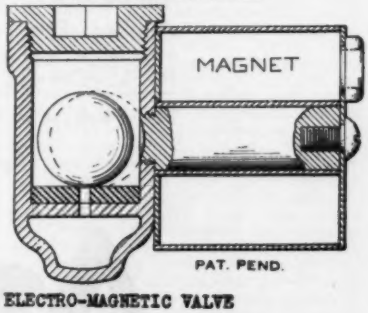
Fuels, such as pulverized coal, oil, or gas can be fired singly or in any combination, and conversion from one or any combination of these fuels to another can be accomplished without any changes to the boiler or furnace.

◆ Electro-Hydraulic and Electro-Magnetic Valves

A line of electro-hydraulic and electro-magnetic valves, invented by A. F. Hoppe, has been announced by Myers Engineering Equipment Co., 401 South Twelfth Street, St. Louis, Mo.



ELECTRO-HYDRAULIC VALVE



ELECTRO-MAGNETIC VALVE

The electro-hydraulic valve is designed for pressures up to 250 pounds and is being supplied in ¼ in., ½ in., ¾ in. and 1 inch sizes. It is simple in construction and consumes only 16 watts per hour. High-grade steel bronze or a non-magnetic iron is used for the body.

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The design is such that the valve automatically closes when the current is off the line pressure opening and closing the valve.

The electro-magnetic valve at present furnished only in the ¼-inch size, is made either with a high-grade steel bronze or non-magnetic body. Attached to the valve is a housing for a solenoid or magnet. When the magnet is energized, it rolls the valve ball horizontally from the valve seat and retains it against the wall as long as the electric current is on. This releases the pressure which was surrounding the ball and permits the prompt passage of the element through the valve to its destination. When the current is turned off, the ball gently rolls back on the seat, thus closing the line tightly.

In both the electro-hydraulic and electro-magnetic valves perfect balls are used and in most instances are made of stainless steel. It is claimed that either valve can be buried underground or submerged in water and can be placed near explosive liquids or gases without injury since there is no exposed electrical arcing or sparking. Another feature is that no adjustments are necessary for these units once they are installed.

◆ ◆

◆ S. A. Staege Now With Black-Clawson-Shartle

S. A. Staege, formerly with the Westinghouse Electric & Mfg. Co., East Pittsburgh, has joined The Black-Clawson-Shartle organization, where he will devote his efforts to the further advancement of the big Black-Clawson and Shartle Brothers paper machinery line and to the development of many special designs to meet special mill conditions.

Mr. Staege has had a long and varied experience in the paper mill field. He was for four years with the Langstadty-Meyer Company, at the time of the electrification of the mills at Appleton and in the Fox River Valley. Later he was with Allis-Chalmers as a paper mill engineer in Northern New York. From 1910 to 1918 he was engaged in hydro-electric and paper mill engineering with offices at Watertown, N. Y.

In the sixteen years he has been with Westinghouse, Mr. Staege spent the first eight years in organizing the paper mill division of the engineering department, directing paper mill electrical applications, surveying the industry, collecting power requirement data for motor drives and developing automatic regulating and control devices and new apparatus. During the past eight years as consulting engineer, he has seen many improvements in the automatic regulation of sectional and single motor paper machine drives, multiple motor winder drives with regenerated breaking and automatic tension control, calender-winder drives, etc. More recently he has devoted special attention to automatic process control and to the use of electrical devices in regulating and control problems and to devices for the measurement of paper opacity, color matching and the measurement of other paper characteristics.

◆ New Catalogues and Publications

American Hoist & Derrick Co., St. Paul, Minn.—Two new catalogues just received from this company cover (1) the line of American hoisting equipment; and (2) the American Eagle Crane, a small, compact gasoline operated crane capable of switching cars, handling loads up to 15,200 lb. and working with hook, clamshell bucket or magnet. These catalogues contain many illustrations and much interesting information.

Automatic Transportation Co., Chicago—A new folder is devoted to descriptive matter covering the new Automatic Steel-bound Skid Platforms and Section Bins.

Barrett-Cravens Co., Chicago—Bulletins 126 and 403 just received feature this company's extensive line of lift trucks and platforms, handling equipment, etc. Literature and information will be gladly furnished.

Foster Wheeler Corp., New York—A new Pulverized Fuel Bulletin contains 24 extensively illustrated pages and is published as part of this company's general catalogue. The bulletin describes in detail the impact mill (Aero type) and the Tricone ball mill (Hardinge type). The last half of the bulletin is devoted to auxiliary equipment used in complete systems. Copies on request.

General Electric Co., Schenectady, N. Y.—A new publication "How to Select Insulated Cable" covers cable for the transmission and distribution of electric power at normal frequencies, and presents in convenient form the information that is required in determining the cable best adapted for a particular installation. The more usual applications of cable are covered, the various types of insulation and finish are described and tables of thickness are given. Tables of wire gauges and dimensions, sizes of shipping reels, and a bibliography are also included.

Jenkins Brothers, New York—A new piece of valve literature in the form of a 12-inch cut-out replica of a Jenkins Standard Iron Body Gate Valve has recently been prepared by this company. This double cut-out gives an exact reproduction of both the exterior and the mechanism of the valve and there is considerable information listed in the available space.

Johns-Manville, New York, N. Y.—The new 1900 deg. Superex Insulating Blocks recently announced by this company is now fully described in engineering folder IN-28-A. In addition to the data on Superex, the folder discusses the principles of combination insulation and shows how the careful selection of two or more insulating materials for use in a furnace or boiler wall not only assures more economical operation, but in many cases results in lower construction costs. Tables of recommended thicknesses of Superex, both when used alone and in combination with other insulating materials are also included.

Linde Air Products Co., New York—A new pamphlet, "The Principles of Bronze-Welding" discusses the compositions and strength characteristics of bronze-welding rods, the underlying theory of the flowing of bronze-weld material and certain important elements of welding technique. There is also now available a new edition of the company's pamphlet entitled "The Progress of Bronze-Welding." Similar in form to previous editions, it contains a comprehensive and instructive story of bronze-welding in all its phases.

Medart Company, St. Louis, Mo.—This company has just published a 42-page loose-leaf booklet termed "Data and Price List" covering full complete and valuable engineering and purchasing information on all types of multiple and fractional horsepower Medart V-Belt Drives. The book will be of special interest to engineers, purchasing agents and production superintendents and may be had upon request.

Merco Nordstrom Valve Co., Homewood, Pittsburgh, Pa.—A bulletin illustrating and describing the latest development in valve design wherein the Nordstrom Lubricated Plug Valve is adapted to gate valve dimensions, has just been issued by this manufacturer. The bulletin describes what is known as the Emco-Nordstrom valve, which has been designed in all sizes from two to twelve inches, to permit installation where gate valves of the same dimensions have been installed. Bulletin No. V-102 includes illustrations, blue-prints and specifications covering the different types for various working pressures. Flanged and screwed valves are shown, also types for worm gear and wrench operation. Copies on request.

Roots-Connersville Blower Corp., Connersville, Ind.—Single-stage centrifugal blowers and exhausters are described in bulletin 120-B10, just published. A table lists capacities up to 8000 CFM at pressures up to 3 lb., but information regarding larger capacities and higher pressures is readily available upon request.

Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.—A 12-page publication entitled "Micarta in the Paper Industry" has been published by this company. Listing the properties, characteristics and applications of Micarta in paper mills, this book is of special interest to those engaged in the operation and maintenance of mills. It comprehensively discusses the following applications: suction box covers, doctor blades, slice boards, table roll covers, shake springs, toe blocks, bearings, gears and piston rings. Actual improved performance figures are included with illustrations showing how the applications are made. Copies may be had by addressing the advertising department.

The Paper Mills Directory of Great Britain and Ireland for 1933-4, the 73d annual edition of this publication, has been published by Printing-craft, Limited, 18, Featherstone Buildings, Holborn, London, W. C. 1. The directory is arranged in a number of sections that are separated from one another by thumb index tabs which make for ready reference. Among the numerous sections are individual sections covering in alphabetical arrangement the paper mills in England and Wales, the board mills in England and Wales, and the paper mills in Scotland and Ireland. There is also information on paper enamellers and surfacers, paper agents and wholesale stationers in London, engineers, machinery manufacturers, chemical manufacturers, paper stock and waste paper dealers, associations and institutions associated with the paper and allied trades, trade customs, trade names and watermarks as well as other data.

It is a 5⅝x8⅝" book of over 350 pages with stiff paper cover, and is priced at two shillings net.

Mechanical Power Transmission from Motor Drive to Industry—This book, written by Robert W. Drake, is an authoritative treatise of 226 pages. Within these pages are discussed many of the engineering problems encountered in various industries in regard to motor and group drives. In reality, it is a publication of fifty reports on the transmission of mechanical power from electric motor to the driven machine in which the problem has been considered from the standpoint of design, maintenance, trouble elimination and comparative production under a wide range of conditions and applications. Among the subjects covered are studies of driven loads and how to belt them; studies of motors and motor loads and how to belt them; fundamentals of belt transmission; comparison of short center drives; trouble jobs and how to handle them; modern group drives vs. individual drives; and belt efficiency.

The book has been published by the American Leather Belting Association, 41 Park Row, New York City. It is understood that superintendents, engineers and master mechanics may obtain copies of this book without cost as long as the present supply lasts.

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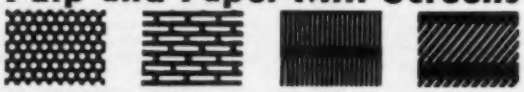

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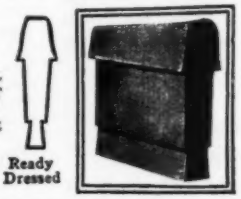

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This section turns the searchlight on power and its allied problems, showing big possibilities to save. Opportunities to improve conditions, methods, apparatus will be discovered. Worth while practices suggest new ideas and wider usages of equipment.

By W. S. JOULE

◆ Repair Stacks in the Summer Time

Probably well over 50,000 steel stacks are in service throughout the country, ranging in size from enormous steel self-supporting stacks of the central station companies, down to the thin sheet steel guyed stack of the small laundry, or sand and gravel plant with its 25-hp. boiler. Every steel stack that is not properly inspected and maintained is a hazard, for all of them are subject to corrosion that may weaken the guy wires or the supports at the base. Moreover, corrosion may also get in its deadly work anywhere between the top and the base. Inspection is the only way to determine the condition of the steel stack and the ideal time to make such inspection is in the summer.

A stack subjected to a superficial inspection of the exterior may indicate apparently satisfactory conditions. When, however, scrutinized closely by a conscientious man traveling around and up the stack foot by foot, it may be found that this disintegration has proceeded rapidly and expensively. Inspection should, of course, be made of the interior as well as of the exterior. Whether corrosion takes place on the inside or outside depends largely upon atmospheric conditions as well as operating conditions; and a stack may be free from corrosion on the inside and yet badly corroded on the outside and vice versa.

Corrosion of the outside of a stack is due in part to the elements and the acids and sulphur fumes of combustion that attack steel quite rapidly in the presence of moisture. Prevention is a comparatively simple matter and one which is not really expensive. The remedy is to paint the steel with a paint that is acid and moisture proof, that can expand and contract with the surface it covers, that will not peel or blister due to heating of the stack.

Painting should be done carefully and conscientiously, using not less than two coats, otherwise pin-hole abrasions may occur and the paint fail to give complete protection. Painting should be done regularly. Every two years seems to fulfill all requirements for average cases.

It is more difficult to prevent corrosion on the interior of a stack; and it will cost more than for protecting the outside because on the inside the hot flue gases have to be contended with. These gases are extremely corrosive, causing rapid disintegration of the steel if means are not taken to prevent them from doing so. This corrosion is due, primarily, to moisture in the flue gases.

Preventing corrosion on the interior of a stack requires that the metallic wall of the stack be protected from the acids and gases by lining with fire brick. This lining should be carefully laid. The intervening space between brick and metal should be filled in completely by grouting with cement. Experience has proved that the upper rings corrode faster than the lower.

A stack which is properly lined is able to stand idle, little affected by corrosion, whereas an unlined stack will probably suffer seriously. A lining is a great advantage, therefore, for plants that may operate only from time to time instead of continuously. Another advantage of lining a stack, besides that of protection, which prolongs its life, is that the radiation losses through the metallic walls are materially reduced, thus improving the draft.

While inspection is being made, it is extremely important to inspect the guy wires in cases of guyed stacks. Corrosion and broken strands must be looked for.

Men mounting stacks should go cautiously as cases with serious consequences have been known where the plate or sheets were so badly corroded they were unable to support a man's weight.

The fact that the steel stack is standing and that it is not easily inspected and gives practically no trouble means that, ordinarily, it will be left alone. Corrosion that goes on unseen is all the more dangerous because it is unsuspected. A stack that falls may not only shut down a plant but may spread havoc, loss and injury broadcast on the streets below. The summer months are the months when inspections can be made and when painting and repairs can be most effectively and most inexpensively carried out. If you have any steel stacks in your plant, inspect them now.

◆ IN PACKING valve stems or piston rods, never use old packing that has been removed. It has lost elasticity, and there is danger of its scoring the rods.

◆ THE GREATEST CARE must be taken in cutting a boiler in on the line with others in service. When the pressure is the same as the line pressure and with the piping and valves drained of all water, crack the stop valve, and if everything sounds good, slowly open the valve until fully open. An observer at the gage should say when the pressure is equal.

◆ Clean Steam Pays Dividends

Dirty steam often causes many unlooked for difficulties. Prevention is better than cure and it is much less trouble and less costly to employ pure water, properly conditioned, than it is to tolerate the use of dirty steam.

The two chief causes of dirty steam are impure water fed to the boiler or excessive water treatment. Either or both conditions become worse when a high water level is carried, when priming occurs, or where a widely fluctuating load takes place or a boiler blowoff valve pops.

An examination of steam traps and separators, when made analytically, gives a good idea of the amount of dirt carried over with the steam. It should be borne in mind, however, that the debris or dirt carried over is actually greater than appears, as much of it passes along into the steam line, through the prime movers, etc. It quickly accumulates, therefore, in those places which are not accessible to inspection and cleaning.

Foreign matter carried over with the steam precipitates on super-heater surfaces, clogging them and often becoming corrosive in the presence of moisture. It tends to reduce the degree of superheat because the layer of precipitate interferes with heat transfer of the superheater. If this dirt reaches the turbine it impinges upon the blading, bringing about rapid erosion or attrition of both blading and nozzles and perhaps causing unbalancing of the rotor, hence vibration, reducing the efficiency of the unit and increasing the water rate.

With reciprocating engines, dirty steam will cause scoring and cutting of valve seats, cylinder and piston, and lubrication troubles, necessitating more frequent filtering or cleaning of the oil. It increases the wear of the packing and often collects around it, building up a mass that is objectionable.

If a condenser is used, the dirt will cover the condenser tubes, interfering with heat transfer, which necessitates increased power consumption in the effort to keep up the vacuum or causes loss of thermal efficiency through lower vacuum. Maintenance costs will also be increased. Valves will become clogged, traps will work sluggishly, separators will need more frequent cleaning, gauges and similar equipment will require more frequent overhauling and become less dependable.

These far-reaching influences of dirty steam may, therefore, be corrected by proper conditioning of feed or boiler water, and the resulting clean steam will pay real dividends.

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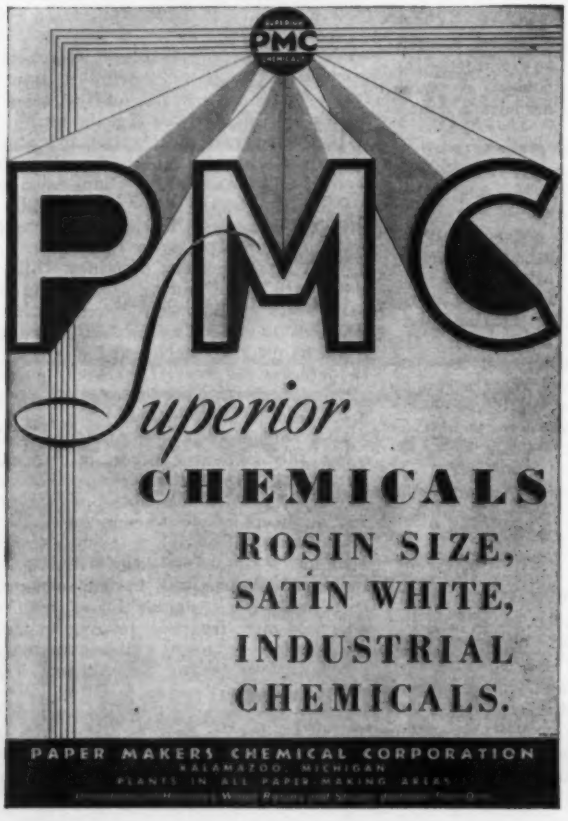
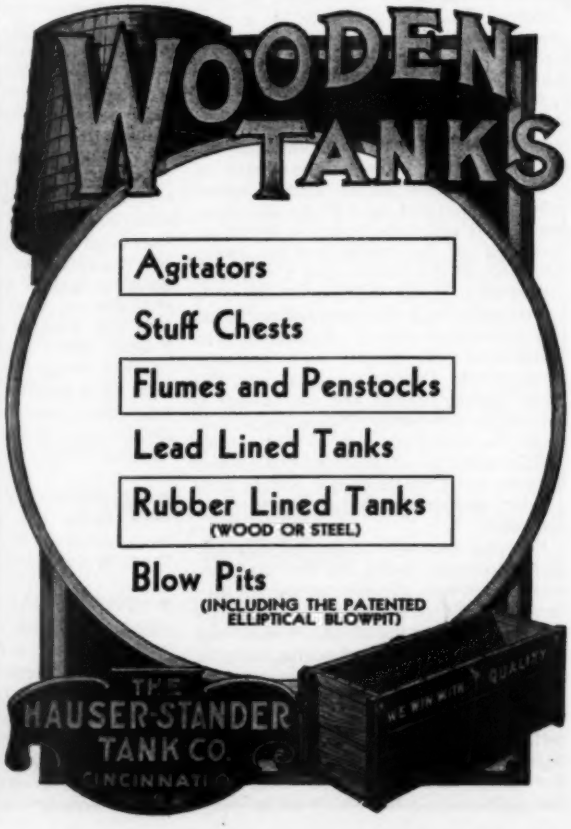
SKANEATELES FALLS, N. Y.

TRADE MARK





The Paper Industry Safety Contest

July 1, 1933 to June 30, 1934
Scores as of May 31, 1934 (Cum.)
7 Mills Keep Perfect Record

PERFECT SCORES

Division I—Paper and Pulp Mills

	PARTICIPANT	MILL	LOCATION
GROUP A			
GROUP B	St. Croix Paper Co.	Woodland	Maine
GROUP C			
GROUP D	Bird & Son, Inc.	Roofing Plant	Chicago, Ill.
	International Paper Co.	Riley	Maine
	Hollingsworth & Whitney Co.	Abenaquis	Madison, Me.
	Spaulding Fibre Co., Inc.	Hayes	No. Rochester, N.H.

Division II—Remanufacturing

Container Corp. of America	Natick	Massachusetts
Southern Container Co.	Houston	Texas

IMPERFECT SCORES

	Key	Rank	Points Credit	Points Debit
GROUP A	PA- 6	1	833.136	
	PA-17	2	760.544	
	PA- 2	3	661.078	
	PA- 1	4	631.478	
	PA- 8	5	569.266	
	PA- 5	6	557.912	
	PB- 5	7	554.698	
	PA- 4	8	505.578	
	PA- 3	9	425.728	
	PA-14	10	262.032	
	PA- 2	11	226.058	
	PA-13	12		93.014
	PA-12	13		202.016
	PA-15	14		353.714
	PA-16	15		497.712
	PA- 7	16		759.382
	PA- 9	17		838.728
GROUP B	PB- 9	2	910.632	
	PC-10	3	796.288	
	PB- 1	4	760.430	
	PB-15	5	680.450	
	PB- 7	6	672.278	
	PB- 3	7	562.042	
	PC- 9	8	550.334	
	PC- 7	9	498.440	
	PB-16	10	379.314	
	PB-11	11	281.078	
	PB- 6	12	185.098	
	PB-14	13	30.626	
	PB-13	14		22.850
	PB- 4	15		128.040
	PC- 2	16		814.874
	PC-19	17		1,237.114

DIVISION II

RB-1	3	829.040	
RD-4	4	824.208	
RC-1	5	752.262	
RD-1	6	720.590	
RC-5	7	717.438	
RD-5	8	634.774	
RC-2	9	400.008	
RD-6	10	120.990	
RC-4	11		73.734
RC-3	12		112.902
RD-3	13		817.786
RD-7	14		993.266

	Key	Rank	Points Credit	Points Debit
GROUP C	PC- 6	1	929.690	
	PC-22	2	780.880	
	PC-14	3	718.558	
	PC-25	4	683.784	
	PD-28	5	672.142	
	PD-17	6	607.024	
	PC-11	7	486.904	
	PB-10	8	472.302	
	PC-15	9	453.082	
	PB-17	10	448.618	
	PD-25	11	424.506	
	PC- 8	12	354.434	
	PC-24	13	314.766	
	PC-18	14	309.082	
	PD-13	15	280.950	
	PC-20	16	214.538	
	PC-23	17	188.000	
	PD-14	18	88.014	
	PC-13	19		75.120
	PC-21	20		87.078
	PC-16	21		136.016
	PC-12	22		156.900
	PC- 3	23		471.810
	PC- 4	24		780.272
	PB-18	25		825.834
	PC-26	26		884.376
GROUP D	PD- 1	5	783.192	
	PD-27	6	755.512	
	PD- 6	7	712.538	
	PD- 9	8	630.898	
	PD-26	9	630.704	
	PD- 4	10	611.128	
	PD-18	11	556.282	
	PD-15	12	532.378	
	PD- 3	13	408.804	
	PD-24	14	67.974	
	PD- 8	15		12.690
	PD- 7	16		248.694
	PD-20	17		338.774
	PD-29	18		779.934
	PD- 2	19		1,103.272

No May Report: PA-11; PD-11, PD-12.

Withdrawn: PA-10; PB-8, PB-12; PC-5, PC-17, PC-27; RA-1.

◆ Program Arranged for Paper and Pulp Section

H. G. Gilson, Oxford Paper Co., Rumford, Maine, and General Chairman of the Paper and Pulp Section of the National Safety Council, announces that all arrangements have been completed for the Twenty-Third Annual Safety Congress, to be held in Cleveland, Ohio, October 1 to 5.

No hit or miss about your ARMCO PIPE installations. This light-weight pipe is accurately fabricated to meet your engineering plans and specifications. • You can eliminate expensive joints, too—trouble-spots—by combining ARMCO PIPE with ARMCO standard fittings. This way you pay less for materials, get an exceptionally tight and efficient line, and reduce installation costs considerably. • ARMCO SPIRAL WELDED PIPE, made of rust-resisting INGOT IRON, is used and preferred by 57 paper mills. It is straight and true round, smooth inside, and surprisingly easy to handle . . . . Long lengths or short. Deliveries are prompt—you order out of our ample stocks. Choice of coatings and wall thicknesses for the use. • Just send your inquiries for pipe to Dept. 31.

THE AMERICAN ROLLING MILL COMPANY

Executive Offices: Middletown, Ohio

ARMCO

ARMCO SPIRAL WELDED PIPE

STRONG ★ EASILY HANDLED ★ SMOOTHBORED

THE DRAPER FELT

Unexcelled for strength, openness, resiliency, and general running qualities. Made to meet the most exacting conditions on all types of machines and all kinds of papers. Only one grade and that the highest.

Made by

DRAPER BROTHERS COMPANY

CANTON, MASS.

Woolen Manufacturers Since 1856

REPRESENTATIVES

L. H. BREYFOGLE, Kalamazoo, Mich. INTERNATIONAL TRADING CO., Philadelphia, Pa.

PACIFIC SALES COMPANY, Security Bldg., Portland, Ore.

Have you made this test?

WE urge every user of Calender Rolls to put a Butterworth Long-Life Roll, new or re-filled, in the stack with any other rolls and time them all. Then you'll understand the greater service you get from the Long-Life Rolls. *They never come loose on the shaft.*

Complete literature on Butterworth Long-Life Rolls will be sent promptly.

H. W. BUTTERWORTH & SONS CO.

Established 1820

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Providence, R. I.	Charlotte, N. C.	Hamilton, Ontario

• BUTTERWORTH *Calender* ROLLS •

Mr. Gilson states that a well balanced program for the Section has been prepared and will soon be formally announced by the National Safety Council.

Among the subjects scheduled for consideration are some of the most vital matters that concern management and safety, and the men chosen to present these facts are thoroughly acquainted with the managerial and safety aspects of business.

Interest in accident prevention work in the paper and pulp industry has never before reached the present peak, and the Section is endeavoring to build up an even greater degree of advance for this economic and humanitarian subject.

Those expecting to attend the Congress are urged to make early hotel reservations at The Statler Hotel, Cleveland, where all of the meetings of the Congress will be held.

◆ Some Problems of Paper Mills in Brazil and France

According to information recently published in "Side Runs of the Paper Trade" by the Bureau of Foreign and Domestic Commerce, paper mills in the Republic of Brazil at present number 22, with a capacity production of 70,252 metric tons (metric ton = 2,205 pounds). A weakness in the Brazilian industry, however, is the lack of available timber suitable for the manufacture of wood pulp. With the development of the industry, the companies which have invested large amounts have attempted to free themselves from the necessity of importing their basic stocks. For many years plantings have been made on a large scale of pine trees, eucalyptus, and others reported or proved suitable for the manufacture of wood pulp. A number of the mills have already installed the necessary machinery and are manufacturing pulp from parana pine and eucalyptus, and several others are now following in their footsteps. One of the largest companies has been devoting careful study, with the help of experts, to the possibilities of several native fibers, such as usasima and carua. Commenting on the situation, the Diario Official of June 1 states that it would be well to consider the futility of any efforts toward the use of certain botanical species, of which there may be great wealth in the Brazilian forests, but which at present are inaccessible to the paper mills. (Commercial Attache Ralph H. Ackerman, Rio de Janeiro.)

The manufacture of kraft paper in southwest France is of relatively recent origin. The first company was organized in 1924 and began production in 1926. Machinery and equipment were imported from Sweden and the first mills were placed in operation by Swedish engineers. At first, attempts were made to manufacture paper from the maritime pine in the same manner as kraft paper was produced in Sweden, but many difficulties were encountered and it was found necessary to modify the process as the percentage of resinous content was found to be much higher in the French wood than in the Scandinavian. Stronger solutions of cooking liquors were required and the time of cooking was prolonged with the result that the tensile strength of the kraft paper produced in France was inferior to the imported Swedish kraft. The shortness of fiber of the maritime pine as compared with the Scandinavian also contributed to lower the quality of the French product. Several of the French companies found it cheaper to import wood pulp from Sweden than to produce their own pulp from the maritime pine. A high protective tariff and a quota on imports of kraft paper now enables the French companies to continue in operation and even increase their output.

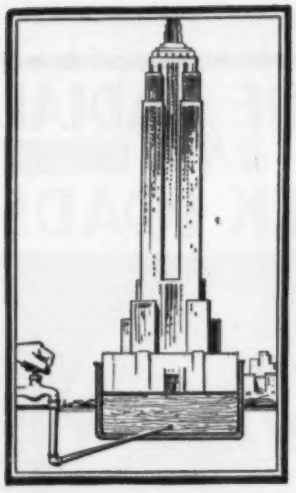
Due to several years experience in adapting the Swedish processes to the maritime pine the French mills now in operation in the Bordeaux consular district have improved the quality and tensile strength of their product manufactured exclusively from the domestic wood. It is estimated that the kraft mills in Southwest France consume approximately 130,000 to 140,000 metric tons of maritime wood annually. The five mills in operation have an estimated annual output of 35,000 to 40,000 metric tons of kraft paper. During 1933 only three of the mills actually produced kraft, the aggregate output for the year being estimated at 25,800 metric tons. (Consul Harold D. Finley, Bordeaux.)

For SEVERE RADIAL and SHOCK LOADS

PRECISION ROLLER BEARINGS afford—for extreme load conditions—the following outstanding advantages... Solid, cylindrical rollers, held to infinitesimal limits of accuracy, provide larger steady load and shock capacity than any other single-row bearing, together with a temporary overload capacity of 50% ...Short roller construction affords ideal load distribution and greater wear resistance... Extruded bronze, machined and balanced, heavy-duty retainer is land-riding, relieving the rolling elements of its weight... Extreme refinement of design and finish gives a lower coefficient of friction under severe load than any other type of bearing and permits speeds up to 35,000 R.P.M.... PRECISION ROLLER BEARINGS interchange in size with all standard ball bearings... Write for the catalog. Let our engineers work with you. . . . . .

NORMA-HOFFMANN
PRECISION BEARINGS
BALL, ROLLER AND THRUST

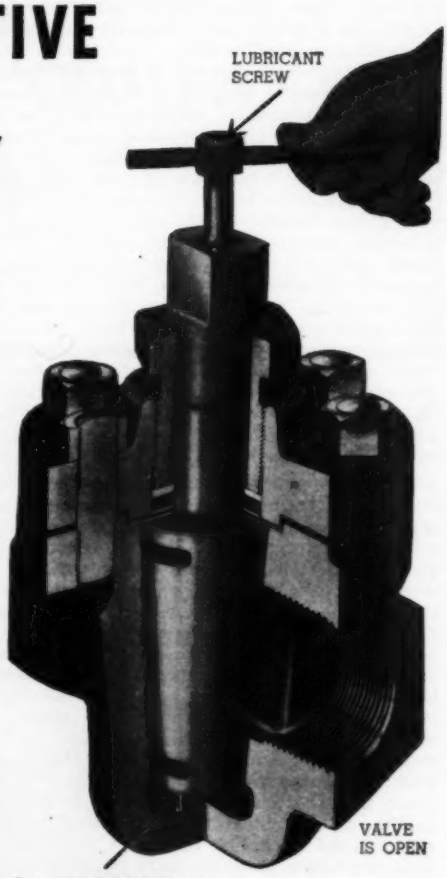
NORMA-HOFFMANN BEARINGS CORP. STAMFORD, CONN., U. S. A.



A TINY STREAM
OF WATER *(OR LUBRICANT)*
COULD LIFT
THE EMPIRE STATE BLDG.

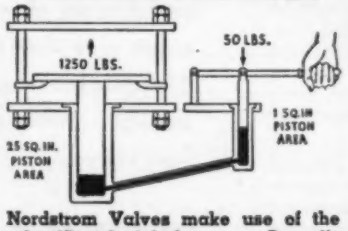
NORDSTROM *Lubricated* PLUG VALVES WITH *"Sealdport"* DESIGN *insure* POSITIVE SHUT-OFF... *no leaks!*

The perfect application of a principle is apparent in Nordstrom Valves. Hydraulic force (using lubricant as the medium) is employed in the correct manner to permit easy turning of the plug. This advantage makes possible the construction of plug valves in large sizes. Turning of a lubricant screw on the top of the plug shank forces plastic lubricant down through channels and grooves around the plug to the bottom lubricant chamber. This chamber, being filled with lubricant under pressure, prevents intrusion of foreign material. Pressure up to several thousand pounds per square inch is easily exerted which lifts the plug from its seat sufficiently to permit turning.



Pressure of lubricant exerts a direct up-thrust. Resilient, frictionless, unexposed packing at top of plug, plus a cushioned film of lubricant around plug gives latter full-floating action.

PASCAL'S PRINCIPLE



Nordstrom Valves make use of the scientific principle known as Pascal's Law. This law states that "a unit pressure applied to the liquid contained in a sealed vessel is transmitted to every part of the liquid with undiminished force, thus multiplying the force many times, depending on the area of the interior of the vessel."

MERCO NORDSTROM VALVE CO.
A Subsidiary of
PITTSBURGH EQUITABLE METER CO.
Main Offices: Pittsburgh, Penna.
Branch offices and warehouses in Principal Cities

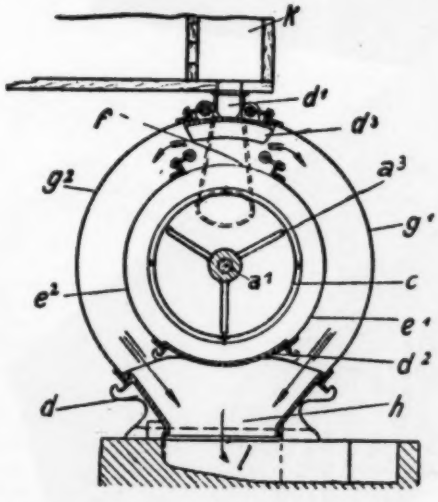
TECHNICAL DEVELOPMENTS

The following abstracts are of the latest developments found in the foreign press and in the patent offices. Photostats and translations of complete articles and patents can be obtained at cost price.

IN THE PAPER INDUSTRY ■ DOMESTIC AND FOREIGN

◆ Centrifiner

According to the *Papermaker and British Paper Trade J*, five patents, all depending upon the use of centrifugal force, have been granted recently in Germany, in connection with new devices for freeing pulp-stock from various impurities. Only one of these is referred to here. It consists of a horizontal centrifiner, which provides for the inlet of the stock through a sieve or screen drum, under pressure. As shown in the diagram, shaft (a^1) carries a wheel with wings (a^3). The latter keep the stuff moving constantly, close to the wire screen. On one face shaft (a^1) is led through the inlet bend. The outlet (d^1) for the coarse stuff is fixed to the other face. The partition beam (d^2) and the bar (d^3) strengthen both faces. The two halves of the inner drum, which has an opening at the top (f) for outflow of the stuff are represented in the diagram by (e^1) and (e^2), and are fixed to the partition beam (d^2). The latter forms an integral part of the inner drum (e^1 and e^2). The outer drum [(g^1) and (g^2)] encloses the centrifuge with the exception of (h), the bottom outlet. The fine stuff is led off through the trough (l); the coarse stuff through the trough (k). Pressure within the centrifiner is regulated by the height of (f). Practical tests show that the pressure may be comparatively low, so that the



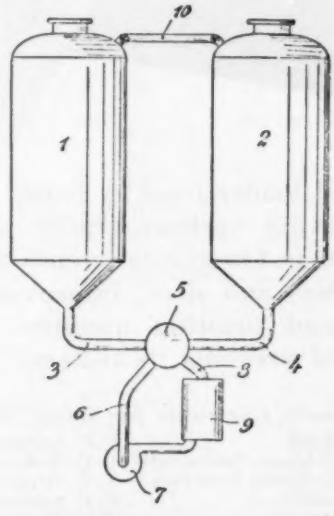
purpose of the machine (i. e. screening under pressure, with the screening area completely filled) is readily achieved. The claim is made that by leading the fine stuff through the space between (e^1, e^2) and the outer drum (g^1, g^2) into (1), the device has distinct advantages over the other types of centrifiner (which provide for the inlet and outlet of coarse stuff, and for the outlet of fine stuff, at the top of the machine). J. M. Voith. Heidenheim, Brenz. German Patent No. 587,882; Kl. 55d.

◆ Alkali Concentration in Sulphate Pulpmaking

The sixth of a series dealing with the soda and sulphate processes (Cf; THE PAPER INDUSTRY, April 1933, p. 57). The higher the alkali concentration, the more rapid the rate of pulping. Delignification is also accelerated when air-dried wood is used in place of green wood. These results hold true for both spruce and Scots pine. The alkaline liquor is either absorbed more rapidly by air-dried wood, or else the water in green wood plays a role in slowing down the reaction in the first stage of the pulping process. A fact, previously observed, that pine is pulped more rapidly than is spruce, may be due to the slightly higher alkali/wood ratio used in cooking the former (21 per cent NaOH of the bone dry weight of the wood in the case of pine, and 20 per cent NaOH in the case of spruce). In either case, 25 per cent of sodium sulphide (based on the weight of dry wood) was used. As the NaOH concentration decreases, the yield figures rise. Other factors remaining equal, the tear and bursting strength also increases with decreasing concentrations of alkali. Green and dry woods gave pulp with very nearly the same strength, although green wood pulps if anything showed a very slight advantage. Pine pulp seemed (very) slightly stronger than spruce sulphate. Erik Hägglund and K. Aarsrud. Svensk Pappers-Tidn. 36,807-9 (1933); through Papier-Fabr., 32, No. 11, 126 (1934).

◆ Pulp Digester

The reader is referred to German Patent No. 573,084, abstracted in THE PAPER INDUSTRY, July 1933, p. 221, which has a somewhat similar but far from identical claim to the following. In this case the cooking liquor is circulated alternately between two digesters, so that the surface of the liquid alternately rises and falls in each. Digesters (1) and (2) are filled with the material to be pulped, and are connected by pipes (3) and (4) with the reversing valve (5).



The digesters are joined above by the pipeline (10). A pump (7) with its suction line (6) also has a heating device (9) built into its pressure line, and is connected with the outlet pipe (8) which leads to (5). The valve (5) is so constructed that in one of its positions (4) is connected directly with (6), while (8) is connected with (3). However the valve may also be turned so that (3) is connected with (6), when (4) is connected with (8). Jens William Aegidius Elling; Oslo. German Patent No. 589,751; Kl. 55b.

◆ Refining Engine

In Fig. 1, the framework (2) supports the vat or tank (1) and above it is placed the motor (3) (with suitable reducing devices) operating the vertical shaft (4). The latter carries the cross-arm (6) to which is attached the upper toothed,

A mineral loader used by many mills making various grades of paper. Its use increases retention of other fillers and sizes, improves formation and printing qualities of the paper and prevents "whiskers."

Other Grasselli Chemicals for Paper Manufacturers

Acetate of Lead	C. P. Ammonium Hydroxide
Aluminum Sulphate, Commercial	C. P. Hydrochloric Acid
Aluminum Sulphate, Iron Free	C. P. Nitric Acid
Aqua Ammonia	C. P. Sulphuric Acid
Barium Carbonate	Muriatic Acid
Barium Chloride	Salt Cake
Barium Sulphate (Blanc Fixe)	Soda Ash
Bleach	Sulphuric Acid
Caustic Soda	Tri-Sodium Phosphate

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ring-shaped grinder (5) as well as a pulp conveying device consisting of a cylinder (7) and a worm conveyer (8) which are suspended in (1). There is a zone (6^a) separating (8) from the grinder (5). As shaft (4) rotates, the conveyer (8) carries the pulp upwards between the moving cylinder (7) and the stationary cylinder (9) which is coaxial with (7). The stuff then passes through the space (6^a) and thence between the upper, rotating grinder (5) and the lower, fixed grinder (11), which is supported by arm (10). Through the agency of a hydraulic device that is neither

Fig. 1.

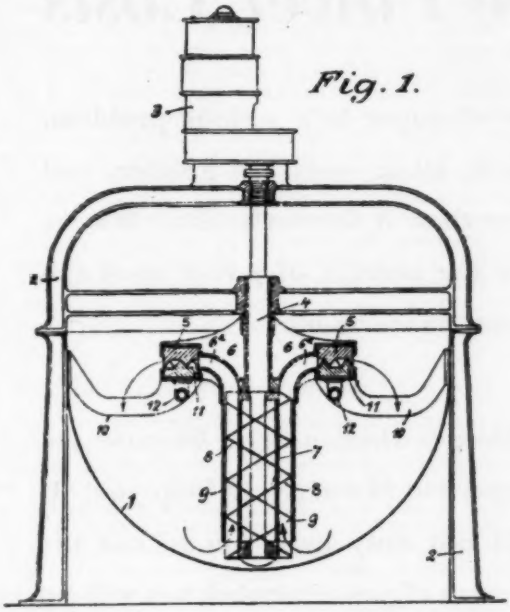


Fig. 2.

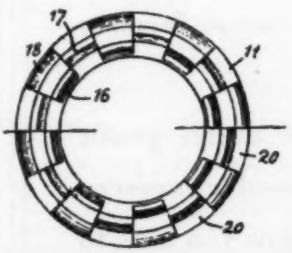
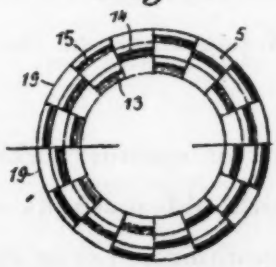


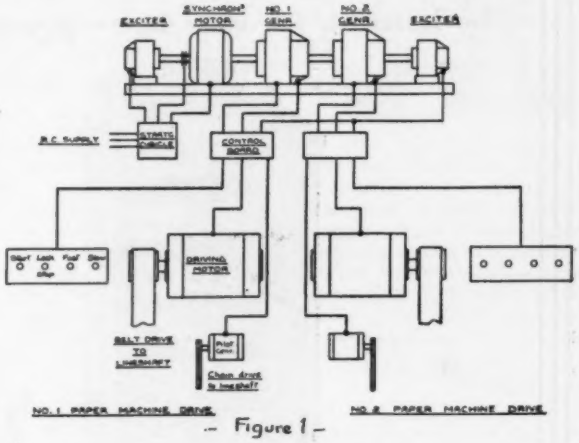
Fig. 3.



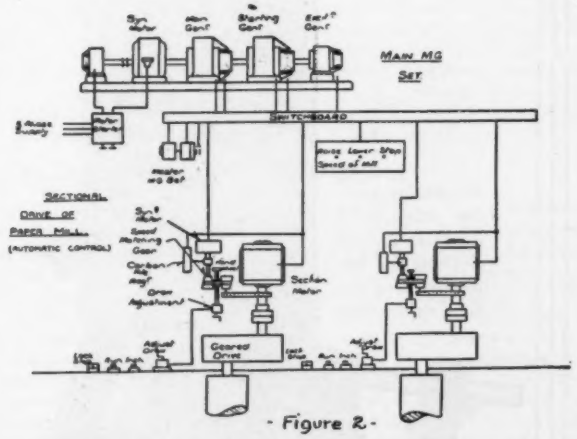
shown nor described, varying pressures may be applied, so as to bring (5) and (11) nearer or further apart at will. Each grinder is actually made up of 3 concentric rings (13), (14) and (15); and (16), (17) and (18) in Figs. 3 and 2 respectively. Removable, standardized grinding sectors as shown in Figs. 2 and 3 may be inserted radially into (and if necessary removed from) suitable rubber rings. The grinding surfaces may be metal or basaltic lava teeth. It will also be noted that there are numerous interspaces keyed out between the actual grinding surface of each ring. The staggered arrangement of these is clearly shown in Figs. 2 and 3. After passing between (5) and (11), the refined pulp is finally hurled by centrifugal force, through the peripheral openings (19) and (20). The claim is made that, since this is a trituration and not a cutting process, there is little change in fiber length, and also that since the time of hydration is shortened, power consumption is lower than in the case of the usual type of beater. Emil Schneebeli, Switzerland. French Patent No. 760,083.

◆ Electrical Drives in Paper Mills

While this is a summary of material already known to many paper-makers in the U. S. A., it deserves attention, since it outlines British practice, and because of certain special features. The article was presented before the London Division of the Technical Section of the P. M. A., in January, 1934. A condensed table furnishes the approximate schedule of mechanical drives affecting the starting and the running of fans, reciprocating compressors, centrifugal and reciprocating pumps, beaters, jordans, supercalenders, winders and paper machines. The data given include starting and running torques, speed and speed variation, overloads as compared with full loads, approximate frequency of starting (per day or hour), and electrical braking and reversing (if any). The factors that must be considered in determining whether individual or group drives should be installed are fully discussed, as are the types and characteristics of motors (D. C. and A. C.). The latter include squirrel cage, slip-ring, variable speed, change-pole, commutator, and power-factor-correcting motors. Single and sectional drives for paper machines are treated at some length, together with supercalender and winder drives. The original article is illustrated with 16 figures (diagrams, graphs, and half-tones) of which only two are reproduced here. Fig. 1 shows diagrammatically a one motor generator set, supplying the motors of two paper machines. Here the control, after the motor generator has been started, is entirely automatic. Press-buttons, conveniently located on the paper machine are



- Figure 1 -

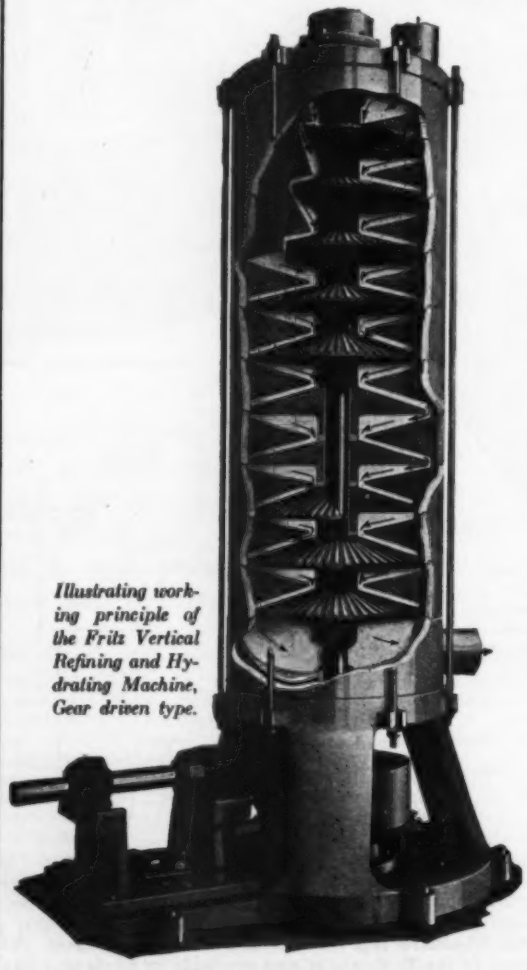


- Figure 2 -

used. Pilot generators (shown in the lower parts of Fig. 1) operate on a speed indicator and on an automatic regulator which corrects for speeds varying from the set values (resulting from differences in load, supply-frequency, etc.). The Ward-Leonard type of control for sectional drives (widely used in the U. S. A.) is also available in England. The set-up of this is shown diagrammatically in Fig. 2. As is customary, the whole paper machine speed is regulated by varying the voltage of the main generator. Individual speed regulation of each sectional motor is controlled by field weakening of that motor itself. However there is also a second generator, which has for its object the starting up of any section

When Profits Slip Away in Excessive Power Costs

• **Making a profit in the manufacture of paper is a serious problem. Prices on raw materials have advanced, labor costs are greater, and every pound of coal costs much more than it formerly did. Where, then, is the profit coming from unless the amount of power used can be lessened, for each horse-power costs more money.**



Illustrating working principle of the Fritz Vertical Refining and Hydrating Machine, Gear driven type.

• **Here is where a FRITZ REFINING AND HYDRATING MACHINE will help you. It will not only help you to cut the amount of power needed, but will enable you to make a much better sheet of paper out of the same furnish.**

• **You cannot make much profit with old methods under present conditions. Let us show you how to make better paper at a smaller cost. Other mills are doing it.**

●

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until this attains the speed of the running sections. Thereupon the motor is automatically transferred to the main generator. The article also discusses adequately other parts of the drive, as well as all phases of the operation used in British practice. H. S. Carnegie. Paper-Maker and British Paper Trade J. (Technical Supplement) 87, No. 3, 76-80; No. 4, 88-96 (March and April 1934).

◆ Modification in Viscosimeters

In measuring the viscosities of non-transparent solutions by use of the falling sphere method, the author finds it expedient to attach a stiff wire to the sphere. At two definitely measured intervals along this wire are two plainly visible marks. The time elapsing between the disappearance of the lower and the upper marks may thus be accurately determined. Another technique consists in noting carefully the time at which each mark on the wire passes a certain fixed line. The relative viscosities of solutions were measured in this way. The stainless-steel sphere is 25 millimeters in diameter. The wire attached thereto is 500 mm. in length and one mm. in thickness, and is also of acid-proof steel. So as to insure rigidity in this wire (and presumably also for purposes of measurement) two very narrow, flat rings are attached to the wire; one exactly 60 mm. and the other 300 mm. from the surface of the sphere. A. Zart. Chem-Fabrik, 6, 266 (1933); through Papier-Fabr. 32, No. 12, 141 (1934).

◆ Halfstuff From Ukrainian Straw

In the Ukraine, straw cooked under pressure with lime has hitherto yielded a halfstuff that gave rise to very low-grade wrappings and cardboard. The present experiments had in view the production of a satisfactory halfstuff. The straw was cooked with aqueous caustic soda containing some sodium sulphite (proportions not given), for ⅔ hours, at 80 deg. C. No pressure was required. The resultant halfstuff gave a good grade of wrapping paper. A better method consisted in running the straw into, and in steeping it in a caustic soda solution. The kollergangs used in handling the pulped material were run in a stone tub, and beating operations were best carried out with a beater roll carrying broad, dull knives. The wrappings finally obtained usually had a weight of 50-60 grams per square meter. Skulskaja Resch and Rubekina-Goyer. Arbeiten des allrussischen Institutes für die Papier-und Zellstoffindustrie, No. 2; 157 (1933); through Papier-Fabr. 32, No. 15, 177 (1934).

◆ Chromium Alloys in Chemical Plants

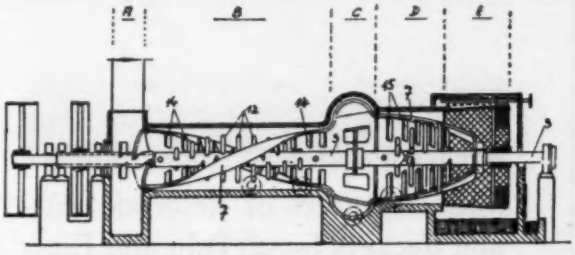
The results of corrosion tests on various chrom-iron alloys are given, together with a resumé of the durability of chromium castings in the presence of corroding agents. Data are are also given on the strength of chrome-steel, and the physical properties of 30 per cent chrome castings. The chromium may in part be replaced by aluminum, and such alloys are termed Sieromal steels. Apparently these remain unattached by gas flames containing sulphur, and a number of typical uses are given for these resistant alloys. The original article contains 20 illustrations. K. Roesch and A. Clauberg. Chem. Fabrik, 6, 317-20 (1933); through Papier-Fabr. 32, No. 12, 142 (1934).

◆ Sulphite Cooking Liquor

The new equipment has been in operation for a number of months at the Lilleström Cellulose Fabrik, in Norway, and was devised by G. Haglund and the Patentaktienbolaget Gröndel-Ramén. It consists ordinarily of 4 tanks connected in series. Entering at one end of this battery is a suspension of finely ground limestone in water, and this travels, by means of overflow pipes, from one container to the next. Each container is provided with a pump that keeps the suspension circulating from top to bottom. At the extreme opposite end of the battery, sulphur dioxide is introduced as a countercurrent to the limestone slush. Through the introduction of definite amounts of calcium carbonate, and by regulating the combustion so that a definite amount of sulphur dioxide is generated per hour, the lime content and SO_2 content of a cooking liquor may be regulated independently of each other, and the strength of the cooking liquor may be reached rapidly and without difficulty. The new equipment requires very little space and the first costs are less than in the case of towers. An advantage lies in the greatly increased surface of limestone that makes contact with the sulphurous acid. L. Saether. Papir-J. 21, 227 (1933); through Papier-Fabr. 32, No. 11, 127 (1934).

◆ Disintegrating and Pulp Purification Equipment

The defibrination and purification requires 5 steps (as indicated in the upper sections of the figure):—(A) the introduction of cooked chips and the separation of heavy materials; (B) dry (or wet) disintegration; (C) kneading of defibrinated material in the presence of water, with an overflow into (D), where the disintegration process is continued in the presence of an ample water supply; (E) the sorting of defibrinated material, with the separation of screenings, etc. Fastened to a hollow shaft is the helically-shaped beater or



defibrinator (7) carrying bars (14) and (15) spaced at intervals, as shown in the illustration. Within (7) there is a smaller, straight, horizontal shaft (3), to which are attached bars (12) and (13). The latter is either stationary or else turns very slowly. In a second patent claim, in place of the bars (14) and (15), there are spade-shaped projections attached to the spiral (7), in such a way that most of these face in the direction of the flow of stuff while a few of the spades face in the opposite direction. Felix Göbl and Sixten Magnus Hjelte; Alfeld, Leine. German Patent No. 591,358. Kl. 55c.

◆ Oxidized Cellulose

By the action of cold, dilute caustic soda solutions, the so-called oxycelluloses investigated by this author all yielded polyglucuronic acids. He also showed that there was a direct correlation between oxycellulose content and the damage to the fiber. (Unfortunately, the abstract gives no means for gauging the degree of oxidation nor the details of the tests used). K. H. Bergmann; Z. angew. Chem., 46,713-716 (1933); through Papier-Fabr. 32, No. 12, 141 (1934).

◆ Chemical Stages in Wood Growth

By carefully rasping birch and larch wood (that had been cautiously barked), shavings were obtained and extracted with cold water and alcohol. These were examined for their lignin content, and also for their percentage of carbon and hydrogen. Evidently the youngest layers of wood examined contain only about 10 per cent of lignin, and the total carbon content of this same wood reaches only 46 per cent. Furthermore, the lignin isolated from the newly formed wood contained only 5.8 per cent methoxyl. It is only after the wood growth has extended over a period of about one year that the usual carbon figures (approximately 50 per cent) and lignin figures (about 30 per cent) are actually reached. The conclusions drawn by Ritter [J. Ind. Eng. Chem., 15,1055 (1923): 18,608 (1926)] regarding differences in composition in the lignin of the middle lamella and that of the cell wall, are not confirmed. Morphologically the differences are great, but there were no observed gross chemical distinctions. The very gradual formation of lignin leads the author to reiterate the theory of Wislicenus, that in the growth of woody tissue, a cellulose skeleton is first laid down by the cambium, from substances in the cambial sap, and that colloidal lignin is subsequently deposited by adsorption, coagulation, and infiltration. Helmut Hempel. Cellulosechem., 15, No. 4, 41-43 (1934).

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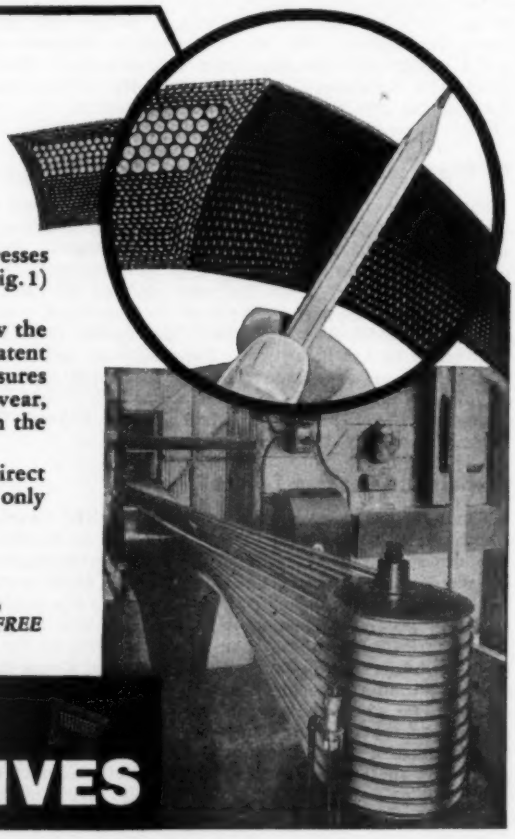


GATES VULCO ROPE DRIVES

The COMMERCIAL OUTLOOK

New York, July 2, 1934.

A RATHER slow condition continues to characterize the paper market, insofar as concerns the development of current demand. Some manufacturers are moderately busy on back orders and contracts, and also are managing to gather in a fair volume of new business, yet it is very evident that buying by practically all consuming interests is along noticeably reserved lines and that the aggregate amount of business being placed is not nearly sufficient to keep all paper and board mills operating on anything near a capacity basis. Doubtless the prevailing quietness of the market can be called in good part seasonal, now that the summer has come and since it is somewhat proverbial in the paper industry that at this period of the year demand for paper of most kinds develops distinct slowness.

Notwithstanding the present quiet state of the market, consumption of paper in the United States is running well ahead of last year, with fairly sharp price advances increasing the importance to the manufacturing companies of the better volume, according to an authoritative review. Last year, as will be recollected, a decided upturn in business set in in the second quarter and prices rose sharply from the extremely low levels which had been prevailing. Seasonal changes have varied the volume in the past year, but the present activity of the industry remains well above that of a year ago.

Newsprint continues to show the most marked increase in production over a year ago, but this has not been accomplished by any price rise. For the first five months of 1934 the industry produced about 32 per cent more newsprint than the 1,095,186 tons which were manufactured in the first five months of 1933. This increase was far more than anyone in the industry had anticipated and has resulted in a large reduction in the pulpwood supplies of the industry. While the sharp increase in demand may not result in any general shortage of pulpwood, it is likely to result in a scarcity at some mills which will force up the price of pulpwood. This in turn should be reflected in a higher price for newsprint, which will also cover additional expenses for the manufacturers for labor. Brush crews last winter received about 25 per cent more in wages than in the 1932-33 winter and the National Industrial Conference Board figures show that the average hourly wage of workers in the pulp and paper industry in the United States increased 16.2 per cent from January, 1933, to March, 1934.

Book and writing paper sales this year are running 5 to 10 per cent ahead of last year, according to the survey. For most of 1933 production of these types of paper followed the general trend of business quite closely, but in the latter months there was a tendency to overproduce. The reaction from this was shown in output in the first four months of 1934 which ran behind consumption. With magazine advertising linage in the first six months of 1934 running 30 per cent over that of last year, it is probable that whatever excess supply of paper had been accumulated during the last part of 1933 has now been used up. Prices for most grades of book and writing papers are 20 to 30 per cent above those prevailing in the first half of 1933. Trade magazines are showing increases in advertising approximately equal to that of the general magazines.

Kraft paper and other wrapping papers and boxboard, which includes kraft board, are also about 10 per cent higher in production than a year ago. Prices of kraft and wrapping papers average around 25 per cent above a year ago, and the higher prices probably mean that this type of paper is yielding the producers a profit in contrast to conditions before the revival last year. Then dumping of paper almost regardless of price had demoralized the market.

The marked improvement in the statistical position of the newsprint manufacturing industry, based on the appreciable increase in production and shipments, is giving rise to expressions of opinion from various corners of the trade of the likelihood of a price advance. No less an authority than the president of the Consolidated Paper Corporation in Canada made the statement at the annual stockholders' meeting of that company in Montreal that there are indications of a possible increase in the price of newsprint. "Newsprint consumption," he said, "has shown an upward trend during the last few months, but the sales price remains so low that profits are impossible, the selling price being the lowest in twenty years."

Mills in the United States produced 89,726 tons of newsprint during May, compared with 83,652 tons in the preceding month and 79,516 tons in the corresponding month last year. Canadian production reached 242,539 tons in May, against 216,507 tons in April this year and 171,776 tons in May a year ago, representing a rise of more than 40 per cent over last year to the best monthly output since November, 1929. During the first five months of this year, United States mills produced 414,981 tons of newsprint, approximately 10 per cent more than in the same period of 1933. Canadian production in the similar time amounted to 1,031,996 tons, against 723,068 tons in the corresponding time last year, a gain of about 44 per cent. The five-month total is only slightly under the high record of 1,086,419 tons produced in the first five months of 1929. The May production of 242,539 tons by Canadian mills compared with 245,644 tons in May, 1929, but the net mill value in May this year was $8,052,000, in contrast to a net mill value of $13,559,000 in May, 1929, a decrease in dollar value of 41 per cent.

Production of paperboard in the United States during April last totaled 244,334 tons, contrasted with 254,819 tons in the preceding month and 223,845 tons in the same month of 1933, according to the monthly summary compiled by the U. S. Census Bureau. Production in April was at 66.1 per cent of mills' rated capacity, against 64.1 per cent in March this year and 58.2 per cent in April a year ago. Board output during the first four months of 1934 totaled 952,830 tons, against 872,578 tons in the similar 1933 period. New orders for board received by manufacturers in April called for 230,754 tons, against 264,985 tons in the month before, while unfilled orders held by mills at the end of April were for 76,578 tons, contrasted with 86,033 tons at the end of the preceding month. Shipments of board from mills in April aggregated 213,956 tons, compared with 221,114 tons in the month before, and stocks on hand at mills at the close of April totaled 82,355 tons, against 84,326 tons a month earlier.

◆ ◆

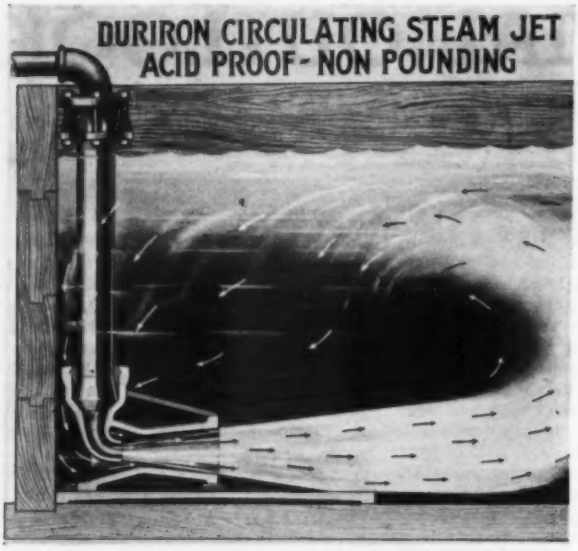
◆ Gair Company Announces Appointments

The appointment of R. H. Bursch as vice-president of Robert Gair Company, Inc., the parent concern of the Gair group, was announced recently by E. Victor Donaldson, president. Effective immediately, Mr. Donaldson stated, Mr. Bursch assumes complete charge of production and sales in all operating divisions of the company in the United States including subsidiaries engaged in the manufacture of boxboards, folding cartons and shipping containers.

Mr. Bursch has held executive posts both in sales and production for the Gair Company for a period of years. Most recently he has been executive vice-president and general manager of the container divisions, to which posts he will now be succeeded by Lorin B. Miller.

Mr. Donaldson also announced the appointment of A. B. Manogue as general board mill superintendent, under Mr. Bursch. Mr. Manogue, for a period of years, has been manager of the company's Haverhill, Mass., mill.

◆ FIBRE MAKING Processes, Inc., is manufacturing for the Washington Pulp & Paper Co., Port Angeles, Wash., two 12 ft. by 45 ft. Suspended Barking Drums, each drum in two sections and drums to be welded. This is in connection with the new wood preparing plant being constructed there.



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PIPE FITTINGS
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A PENNY FOR SOME FOLKS' THOUGHTS IS A PENNY TOO MUCH

—Uncle Jake

This is particularly true for those in the paper industry who go around piously telling everybody else "it pays to advertise," but whose personal policy is to let George do it.

What are we thinking about!

Here we are, the one industry that stands to profit most by any increase in advertising appropriations—doing almost nothing about it.

Truly, "where there is no vision the people perish."

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Domestic RAW MATERIALS

◆ Papermaking Rags

The market for papermaking rags, from a domestic consuming demand standpoint, is near to dormancy. Paper manufacturers are showing very little buying interest; in fact, reports tell of most mills being practically completely out of the market while apparently not in need of supplies and while lacking incentive to buy against potential forward requirements. Dealers say that not in some time has the market been quite so inactive as during recent weeks, and many paper manufacturers are candid enough to state they expect to remain out of evidence as buyers through July.

Under such circumstances it is not surprising that prices have developed an easy tone. However, something of a new development has occurred which is having appreciable influence in helping to sustain market levels. This is a growing movement of papermaking rags for export from the United States. European consumers are inquiring freely here for rags, notably those in England, and some on the Continent, and reports from authoritative quarters of the trade say that substantial quantities of both new and old rags have been shipped abroad. Mills in Europe, evidently finding they can purchase rags on this side of the Atlantic at favorable costs, owing to the relatively high markets prevailing in their own countries as well as to exchange levels, are said to be looking to the United States to secure a good portion of their rag supplies. Thus, a turnabout situation has developed, where the United States has become an exporter instead of an importer of papermaking rags. The significance of this to domestic paper manufacturers is self-evident.

Recent inquiries from abroad lead dealers to believe an excellent foreign market will be provided over the next few months, and there is consequently restricted pressure to sell despite the very limited buying interest exhibited by domestic paper mills. It is asserted that, were it not for the exports during the last several months, the probabilities are the market would have dropped fairly sharply as a result of the very thin domestic consuming demand, the export movement having served to hold up prices comparatively well. Nevertheless, there has been some easing of market levels on most grades of new cotton cuttings, and reports are that No. 1 white shirt cuttings are available at 6.25 cents, and perhaps at 6 cents, f. o. b. dealers' shipping points, new unbleached muslins at 6.75 cents, light silesias at 4.25 cents, new blue overall cuttings at 4 to 4.25 cents, new khaki cuttings at 3.75 cents, fancy shirt cuttings at 2 cents, and washables at 1.50 cents.

In old rags, there is a moderate movement also of No. 1 white cottons for export, and it is stated better prices are being obtained in sales abroad than domestic mills are willing to meet. Repacked No. 1 whites are reported available at around 3 cents a pound at shipping points, with the full range from about 2.75 to 3.25 cents, depending on quality of the packing concerned. Thirds and blues are under distinct neglect of buyers and prices of these rags are uncertain, though it is said repacked thirds are to be had without difficulty at 1.25 cents or thereabouts and twos and blues at 1.50 to 1.65 cents f. o. b. shipping points. Roofing rags are being absorbed steadily by felt paper mills, and prices are fairly maintained though in some quarters slight recessions have been recorded.

◆ Rope and Bagging

The market for old rope has taken on a rather firmer undertone since the partial removal of the compensatory tax on paper bags, and the consequent expectation that consumption of rope paper bags and demand for old rope will increase. The tax is eliminated on bags of 75 pounds or more capacity, and reduced on other paper bags. Thus far, actual demand for old rope has expanded but slightly, if at all, and the nominal price basis on No. 1 domestic old manila rope is 2.25 cents a pound f. o. b. shipping points, while mills offer only 2 cents or but a little more for foreign old rope. Bagging has slowed down perceptibly.

◆ Old Paper

A new development has arisen in the old paper situation. Dealers in the East, cooperating under their Code organization, have inaugurated a program of collection curtailment, by which they are aiming to reduce materially the supply of old paper—more particularly the low or bulky grades—reaching the market. The movement has not been in vogue long enough to have telling influence, although in the specific case of folded news, it is reported from the East that the price tone is tending very visibly to strengthen.

Otherwise, the waste paper market is quiet, and on the easy side decidedly. Further price reductions have been recorded, and market levels in some instances are lower than have been seen in a long time. No. 1 mixed paper is selling in the East at 20 cents per hundred pounds f. o. b. New York, and folded news at 30 cents; in the West, quotations are 35 cents and 45 cents, respectively. Books and magazines are down to 60 cents per hundred pounds f. o. b. dealers' points, old kraft paper is reported available at a cent a pound, old corrugated boxes at 40 cents per hundred pounds, white ledgers at 1.35 cents a pound, colored ledgers at 90 cents, hard white shavings at 2.15 cents, soft white shavings at 1.85 cents, and hard white envelope cuttings at 2.70 cents.

◆ Pulpwood

Reports tell of a stiffening trend in prices of pulpwood. Demand in recent months has been fairly large and most of the available supply on the market has been absorbed, with the result sellers are seeking higher values. In most cutting regions at least slight advances have been recorded.

◆ Mechanical Pulp

A distinctly firm tone characterizes the market for domestic and Canadian groundwood. The firmness is based on most producers having sold their production for some time to come, and now being reticent about committing themselves farther ahead, with the result offerings are anything but plentiful. It is stated that some grinders, both on this and the other side of the Canadian border, have ceased offering entirely for the present, and actually are turning down orders. On the other hand, Scandinavian producers are said to be seeking orders, and have lately reduced their prices a shade. Members of the trade assert a decided scarcity of groundwood may ensue in this countrty should grinding plants be seriously hampered by droughts this summer. Domestic groundwood is about $27 a ton f. o. b. pulp mills, while Canadian groundwood is quoted at $25 ex dock American Atlantic seaboard for prime moist pulp brought down by vessels, equivalent to between $29 and $33 a ton delivered at consuming points.

◆ Chemical Pulp

A steady tone prevails in the chemical wood pulp market although there is little activity of current character developing. Most domestic producing mills, however, have their output fairly well sold on orders booked some time ago, and are not over-eager to sell during the prevailing quiet spell in the paper industry and appreciating paper manufacturers are not prone to buy while awaiting developments in their own markets. Established price bases are fully maintained, and manufacturers show no disposition to deviate from these levels. Prime bleached sulphite is 2.75 cents per pound ex dock Atlantic seaboard, while unbleached sulphite is 2.10 to 2.20 cents for the ordinary prime grades and 2.25 and 2.30 cents for easy bleaching and Mitscherlich sulphites. Domestic bleached soda pulp holds to a price basis of 2.50 cents delivered paper mills, and domestic kraft pulp is on a range of 1.75 to 2 cents at producing points for the average quality grades.

◆ Chemicals

Argentine casein prices continue to edge lower and quotations on the fine mesh product range from 12 to 13.25 cents a pound, while domestic is quoted at 13 to 14 cents for fine mesh and 12.50 to 13 cents for coarse ground. Lump alum is quoted at 3.25 to 3.50 cents, ground at around 3.50 cents, and powdered at 3.65 to 3.85 cents. Brimstone is $18 to $22 per long ton at mines, depending on tonnage and time of shipment.

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Import and Export MARKETS

IMPORTS

◆ Wood Pulp

The market for imported wood pulp is quiet decidedly yet is exhibiting an undercurrent of steadiness as regards quoted prices. Producers and shippers abroad are not pressing to sell in the United States although visibly eager for orders in some instances, while paper and board manufacturers in this country, apparently well supplied for a time and in little mood to add to their stocks or commitments, are pursuing a waiting and watching policy and engaging in very little purchasing.

There is much conjecture concerning what is likely to happen to wood pulp prices over the next few months. Majority opinion is, it can be stated, that not much change will occur; that is, no broad market fluctuations in either one direction or the other. Indications are, and most reports substantiate the signs, that pulp mills in Scandinavia and elsewhere in Europe are well sold up for the remainder of this year, and it seems hardly probable any material pressure to sell will be witnessed for some time to come or certainly not until late in the year when it may be some producers may strive to secure contracts for their 1935 pulp output.

Members of the pulp trade express confidence regarding the price outlook. They feel that established market levels here will surely be maintained, and that if changes of any consequence develop they will be in an upward course, depending of course on the demands of consumers based on developments in the paper and board markets. Some in the trade believe that higher prices later in the year will be seen, if demand broadens as it is expected to. This, all agree, depends entirely on what demands on the market are made by paper manufacturers in this country and in other consuming countries. At any rate, it is felt that sellers will surely adhere to established market levels, even should demand continue at the low ebb reached during the past couple of months. On the other hand, paper manufacturers themselves are somewhat perplexed concerning the future of prices. The likelihood is they would prefer to see market levels sustained, because a stable pulp market is very helpful in the maintenance of their own markets.

Quoted prices have not budged over the last month. There has been some talk of re-sales by paper mills, and it is quite probable some lots of pulp have been disposed of by first-hand owners to other consumers, but such cases have been the exception and have failed to have influence of importance on the market. Prime bleached sulphite is 2.75 to 2.90 cents per pound, according to grade, ex dock American Atlantic seaboard, with extra quality brands ranging upwards from 3 cents a pound. Prime strong unbleached sulphite is 2.10 to 2.20 cents ex dock basis, easy bleaching and Mitscherlich sulphites 2.25 and 2.30 cents, and prime Swedish kraft pulp 1.80 to 1.90 cents.

Imports of pulp into the United States decreased sharply during April as compared with the several previous months. The April receipts of chemical pulp totaled 68,884 long tons, valued at $3,118,428, according to official U. S. Department of Commerce figures, contrasted with 97,694 tons of a declared value of $4,241,737 in the preceding month, 128,708 tons in February of a value of $5,003,543, and 55,722 long tons of a value of $2,097,085 in April, 1933. Despite the falling off in April, the imports of chemical pulp during the first four months of this year registered a substantial gain over the corresponding period last year, totaling 420,197 long tons of a value of $17,061,603, against 338,161 tons of a value of $11,953,513 in the same time a year ago, an increase in tonnage of 24 per cent.

Groundwood imports in April amounted to 12,717 long tons of a value of $233,827, contrasted with 8,249 tons of a value of $154,994 in the month before, and making a total for the first four months of the current year of 44,289 long tons of a value of $791,194, against 27,515 long tons of a value of $484,900 in the similar period last year.

◆ Paper

The value of paper imports into the United States continued to climb during April last, when finished paper valued at $7,567,345 was imported, according to figures compiled by the U. S. Department of Commerce, compared with $6,665,375 in the month before, and $5,867,650 in April last year. The four months' imports this year reached a total value of $25,944,900, an appreciable gain over the receipts valued at $21,325,929 in the similar period of 1933. Newsprint comprised the major portion of imports in April last, amounting to $6,729,921, against $5,721,529 in the preceding month, while imports of cigarette paper were valued at $345,105, compared with $374,171. Newsprint imports during the first four months of this year were valued at $22,466,533, against $19,074,273 in the same time last year.

◆ Paper Stock

Importations of rags for papermaking into the United States in April last amounted to 13,043,114 pounds, valued at $124,230, according to U. S. Department of Commerce statistics, comparing with 8,677,247 pounds of a value of $115,242 in the preceding month, and bringing the total for the first four months of this year up to 35,056,848 pounds of a declared value of $403,850, against 17,645,049 pounds of a value of $137,823 in the corresponding period of 1933. Imports of miscellaneous paper stock, comprising old rope, bagging, waste paper, etc., in April were 6,061,361 pounds of a value of $96,314, against 6,514,020 pounds of a value of $85,294 in March last, and making a total during the first four months this year of 21,522,455 pounds of a value of $329,128, contrasted with 21,672,090 pounds of a value of $210,451 in the same time a year ago.

EXPORTS

In point of value, paper exports from the United States were lower in April than in March of this year, but the four months' imports in the current year were above the same period of 1933 as were the April shipments compared with the same month last year. Total paper exports in April last were valued at $1,574,681, according to U. S. Department of Commerce figures, contrasted with $1,631,808 in the preceding month, and $1,052,357 in April a year ago. Exports during the first four months this year reached a value of $6,069,673, against $4,308,830 in the corresponding period of 1933.

Exports of newsprint in April were 8,015,289 pounds of a value of $157,742, compared with 955,458 pounds of a value of $22,026 in the similar month last year. Shipments of uncoated book paper were valued at $57,402 in April, against $48,834 last year, while wrapping paper exports were valued at $136,035, against $103,964, and writing paper shipments reached a value of $94,013, contrasted with $58,704 in the same 1933 month. Tissue and crepe paper exports were valued at $51,050 in April, against $47,336 a year ago; of toilet paper, $39,285, against $25,511; of sheathing and building paper, $14,648, against $8,935; of blotting paper, $11,199, against $11,488; of boxboard, $45,646, against $56,266, and of other paperboard, $52,727, against $36,025.

Exports of paper bags were valued at $57,677 in April, compared with $39,027 in 1933, and of paper boxes and cartons, $40,070, contrasted with $33,871 last year. United States exports of wood pulp and other paper stock during April were valued at $1,574,681, contrasted with $1,052,357 in the same 1933 month.

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